FACT SHEET

NPDES Permit Number: ID-000022-1
Date:
Public Notice Expiration Date:

The United States Environmental Protection Agency (EPA) proposes to re-issue a National Pollutant Discharge Elimination System (NPDES) permit to:

FMC Corporation
Phosphorus Chemicals Division
P.O. Box 4111
Pocatello, Idaho 83205

and requests the state of Idaho to certify this NPDES permit pursuant to 40 CFR Part 124.53.

NPDES Permit Re-Issuance

EPA proposes to re-issue an NPDES permit to the FMC Corporation. The draft permit places conditions on the discharge of pollutants from the phosphorus production plant non-contact cooling water to the **Portneuf River** pursuant to the provisions of the Clean Water Act (CWA).

This Fact Sheet includes:

- information on public comment, public hearing and appeal procedures;
- a description of the current discharge;
- a listing of past and proposed effluent limitations, schedules of compliance and other conditions;
- a map and description of the wastewater discharge; and
- detailed technical material supporting the conditions in the permit.

Idaho State Certification

EPA requests the Idaho Division of Environmental Quality to certify the NPDES permit for the FMC Corporation, under section 401 of the CWA.

Public Comment

Persons wishing to comment on or request a Public Hearing for the proposed permit may do so in writing by the expiration date of the Public Notice. A request for a Public Hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. All comments and requests for Public Hearing must be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the comments and issue the permit. The permit will become effective 30 days after the issuance date, unless a request for an evidentiary hearing is submitted within 30 days.

Availability of Documents
The draft NPDES permit and other related documents can be obtained or reviewed by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (See address below). Draft permits, Fact Sheets, and other information can also be found by visiting the Region 10 website at www.epa.gov/r10earth/offices/water/npdes.htm.

United States Environmental Protection Agency (EPA)
Region 10
Park Place Building, 13th Floor
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-1214 or
1-800-424-4372

This material is also available from:

United States Environmental Protection Agency (EPA)
Idaho Operations Office
1435 North Orchard Street
Boise, Idaho 83706
(208)378-5746

TABLE OF CONTENTS

I. BACKGROUND

A. Applicant

FMC Corporation
Phosphorus Chemicals Division

Facility Location:
Highway 30 West of Pocatello, Idaho

Mailing Address:
P.O. Box 4111
Pocatello, Idaho 83202

Facility Contact:
David Buttelman, HS&E Manager
(208)236-8635

B. Activity

FMC-Pocatello is located approximately 3 miles northwest of Pocatello, Idaho and 1 mile southwest of the Portneuf River, a tributary of the Snake River. The majority of the site (including most of the processing areas) is located on the eastern portion of the Fort Hall Indian Reservation. FMC Corporation owns approximately 1,500 acres of property. There are several small parcels of property owned by FMC Corporation to the north of Highway 30, but these parcels do not include any processing activities or discharge of wastewaters. The commercial product produced at the FMC facility is elemental phosphorus, known chemically as P4.

The plant produces non-process cooling wastewater from the following industrial activities: bearing case cooling in briquetting process, beam cooling and fan bearing cooling in calcining process, furnace cooling, steam condensate from phos dock operations, and boiler blow down and condensate. The facility has an average annual flow of 2.27 million gallons per day (mgd) with a peak flow of 3.02 mgd. Details about the treatment process are discussed in Appendix A and a map showing the location of the facility is located in Appendix B.

D. Permit History

Date	Action
September 21,1973	Initial permit issuance - contained limits for total phosphorus, suspended solids, fluoride, pH, temperature, and flow. Required the facility to separate process water from the discharged effluent by October 1, 1975 Expiration date: June 30, 1977.
August 19, 1977	Permit re-issuance. Maximum effluent flow limit had been decreased from 3.2 mgd to 2.44 mgd. Modification of pH range was changed from 6.5-9.0 to 6.0-9.0. Maximum effluent temperature was increased from 92°F to 96°F. Daily average phosphorus limits were decreased from 52.2 kg/day to 38.6 kg/day and average daily limits were decreased from 95.7 kg/day to 64.7 kg/day. The fluoride limit was removed. Expiration date: June 30, 1982.
November 27, 1981	Permittee requested modification to remove flow limits in permit.
December 28, 1981	Permittee requested modification to reduce monitoring frequency requirements for pH and phosphorus.
November 24, 1982	Permit re-issuance. Removed limits for phosphorus, suspended solids, and pH. Added thermal loading limit. Expiration date: November 23, 1987.
September 1, 1994	Application received for permit re-issuance.

E. Plant Performance. A review of the Discharge Monitoring Reports (DMRs) and Compliance Sampling Inspection Reports for the past six years shows that the FMC plant has complied with the terms of the current permit and have reported no violations. However, the compliance file indicates several instances of unpermitted releases of pollutants to the NPDES outfall. These instances are as follows:

- On August 22, 1995, process water was discharged as a result of improper pipe connection by contractor for approximately 16 hours.
- On December 19, 1993, process water was discharged as a result of a leak in a furnace sidewall for approximately 2.5 hours.
- On July 20, 1989, process water was discharged as a result of improper pipe connection for approximately 14 hours.
- On February 23 through 25, 1989, stormwater (snow melt) was discharged to the outfall.

- On July 3, 1986, process water was discharged as a result of furnace start-up.
- On November 29, 1982, process water was discharged as a result of a plugged process line in furnace spraying into dome cooling water.

These instances of unpermitted discharges indicate that additional monitoring and/or limits need to be imposed on this facility.

II. RECEIVING WATER

Portneuf River, Idaho

FMC phosphorus production plant cooling water will be discharged to the Portneuf River through outfall 001, located at latitude 42°54’44” and longitude 112°31’10”. The Portneuf River is located in the Upper Snake hydrologic basin. The river flows from its headwaters at the Portneuf Reservoir, through the city of Pocatello, Idaho, ultimately joining the American Falls Reservoir. The annual flow of the river is characterized by low flows during the summer and fall seasons and peak flows during the winter and spring seasons. The peak flow is due to high precipitation in December and January and winter snowpack melts until May or June. In the summer and fall, low flows are due to agricultural uses.

The Idaho water quality standards designate agricultural water supply, cold water biota, salmonid spawning, and secondary contact recreation as beneficial uses for this segment of the Portneuf River. The EPA has stated that the lower Portneuf River and the American Falls Reservoir have had severe water quality problems since 1964 (EPA, 1977) and identified the FMC plant as a contributor to the nutrient and aesthetics impairment of these water bodies.

Permitted point sources of pollution in the lower Portneuf River include the city of Pocatello wastewater treatment plant (WWTP) and the FMC phosphorus production plant. The primary nonpoint sources of pollutants are irrigated croplands, grazing lands, and springs. Storm water discharge systems and several other discrete sources are included with the more traditional nonpoint sources for loading analysis due to a lack of data and methodology for separate evaluation. No stormwater from the FMC industrial facility is discharged to the Portneuf River.

In 1992, the Portneuf River was identified as water quality limited from its headwaters to American Falls Reservoir for bacteria, nutrients, and sediment. Therefore, the state of Idaho was required by the CWA to develop a Total Maximum Daily Loading (TMDL) management plan for the Portneuf River. The State issued a draft TMDL to EPA on November 2, 1998. It is not anticipated that the final TMDL will be issued prior to the issuance of this NPDES permit. Once the TMDL is issued, the TMDL loadings will be incorporated into the permit either by modifying the current permit or at the time of reissuance.

III. EFFLUENT LIMITATIONS

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the CWA provide the basis for the effluent limitations and other conditions in the draft permit. The EPA evaluates discharges with respect to these sections of the CWA and the relevant NPDES regulations in determining which conditions to include in the permit.

A. Summary of Draft Permit Limitations

In the permit application, the FMC Corporation identified the following pollutants as being present in their discharge: strontium (Sr), vanadium (V), uranium (U), bromide (Br), fecal coliform, fluoride (F), nitrate-nitrite as N, total organic nitrogen as N (TON), total phosphorus as P, total alpha radiation, total beta radiation, total radium (Ra), total radium 226 (^{226}Ra), sulfate as SO_4, total barium (Ba), total boron (B), total cobalt (Co), total iron (Fe), total magnesium (Mg), total manganese (Mn), total zinc (Zn), total phenols, biochemical oxygen demand (BOD), total suspended solids (TSS), chemical oxygen demand (COD), ammonia as N, pH, and temperature. In addition, EPA had reason to believe, by the nature of the effluent and from previous studies by RCRA and Superfund, the following pollutants to be present in the discharge: oil and grease, dissolved oxygen (DO), orthophosphate (PO_4), lead 210 (^{210}Pb), nickel (Ni), elemental phosphorus (P_4), polonium 210 (^{210}Po), radium 228 (^{228}Ra), total dissolved solids (TDS), turbidity, aluminum (Al), antimony (Sb), arsenic (As), beryllium (Be), cadmium (Cd), total chromium (Cr), trivalent chromium (Cr^{+3}), hexavalent chromium (Cr^{+6}), copper (Cu), lead (Pb), lithium (Li), mercury (Hg), molybdenum (Mo), selenium (Se), silver (Ag), thallium (Tl), total cyanide (CN), and total residual chlorine (Cl). Each of these pollutants will be discussed in section III.D, below. The discussion will include a determination whether there is reasonable potential for violation of water quality standards. Where reasonable potential exists, limits are developed to be incorporated into the permit.

The first step in developing limits is to determine the wasteload allocation (WLA) and the time frame over which the WLAs apply. In general, the period over which a criterion applies is based on the length of time the target organism can be exposed to the pollutant without adverse effect. For example, aquatic life criteria generally apply as one-hour averages (acute criteria) or four-day averages (chronic criteria). Finally, the WLAs are statistically converted to average weekly and monthly average permit limits. In translating the WLA into permit limits, EPA followed the procedures in the Technical Support Document (TSD)(EPA, 1991). When converting concentrations to mass loadings, the concentration was multiplied by the average annual flow of 2.28 million gallons per day and a conversion factor of 8.34 to obtain the units of pounds per day.

Table III-1 presents the FMC phosphorus production plant effluent limitations for the draft permit. For comparison purposes, the table also shows the effluent limitations of the current permit.

TABLE III-1: EFFLUENT LIMITATIONS

PARAMETER	UNITS	AVERAGE MONTHLY		MAXIMUM DAILY		AVERAGE DAILY		MINIMUM DAILY	
		CURRENT (1982)	DRAFT (1999)	CURRENT (1982)	DRAFT (1999)	CURRENT (1982)	DRAFT (1999)	CURRENT (1982)	DRAFT (1999)
Ammonia	mg/L	---	0.08	---	0.35	---	---	---	---
	lb/day	---	1.44	---	6.71	---	---	---	---
Cadmium (Cd)	µg/L	---	1[1]	---	3	---	---	---	---
	lb/day	---	0.02	---	0.06	---	---	---	---
Chlorine, Total Residual[2]	µg/L	---	6	---	19	---	---	---	---
	lb/day	---	0.11	---	0.36	---	---	---	---
Copper (Cu)	µg/L	---	15.8	---	29.8	---	---	---	---
	lb/day	---	0.30	---	0.57	---	---	---	---
Cyanide (WAD)	µg/L	---	4.0	---	16.7	---	---	---	---
	lb/day	---	0.08	---	0.32	---	---	---	---
Elemental Phosphorus	µg/L	---	---	---	0.10[3]	---	---	---	---
Fluoride (F)	mg/L	---	4.3	---	17.0	---	---	---	---
	lb/day	---	81	---	323	---	---	---	---
Lead (Pb)	µg/L	---	2.5	---	11.5	---	---	---	---
	lb/day	---	0.05	---	0.22	---	---	---	---
Nitrate+Nitrite as N	mg/L	---	0.10	---	0.15	---	---	---	---
	lb/day	---	1.90	---	2.87	---	---	---	---
Orthophosphate as P	µg/L	---	35	---	90	---	---	---	---
	lb/day	---	0.66	---	1.71	---	---	---	---
Selenium (Se)	µg/L	---	3.7[4]	---	12.2	---	---	---	---
	lb/day	---	0.07	---	0.23	---	---	---	---
Silver (Ag)	µg/L	---	2.9	---	9.7	---	---	---	---
	lb/day	---	0.06	---	0.19	---	---	---	---

TABLE III-1: EFFLUENT LIMITATIONS										
PARAMETER	UNITS	AVERAGE MONTHLY		MAXIMUM DAILY		AVERAGE DAILY		MINIMUM DAILY		
		CURRENT (1982)	DRAFT (1999)	CURRENT (1982)	DRAFT (1999)	CURRENT (1982)	DRAFT (1999)	CURRENT (1982)	DRAFT (1999)	
Temperature[5] (Aug 2 - March 31)	°C	---	---	---	21	---	19	---	---	
	BTU/day	---	---	$4.39x10^8$	$1.0x10^8$	---	---	---	---	
Temperature[5] (April 1 - Aug 1)	°C	---	---	---	13	---	9	---	---	
	BTU/day	---	---	$4.39x10^8$	0	---	---	---	---	
Total Phosphorus as P	µg/L	---	70	---	180	---	---	---	---	
	lb/day	---	1.32	---	3.43	---	---	---	---	
Zinc	µg/L	---	79.1	---	192	---	---	---	---	
	lb/day	---	1.51	---	3.65	---	---	---	---	

1 Shall be below detectable limits prior to discharge based upon the EPA approved method 200.7. Final compliance evaluation limit is 2 µg/L (0.04 lb/day).
2 Shall be below detectable limits prior to discharge based upon the EPA approved DPD method 330.4. Final compliance evaluation limit is 100 µg/L (1.9 lb/day).
3 The permittee shall initiate an investigation and report to EPA when levels are exceeded.
4 Shall be below detectable limits prior to discharge based upon the EPA approved method 270.2. Final compliance evaluation limit is 5 µg/L (0.1 lb/day).
5 Thermal loading shall be computed using the following formula:
[flow (gal/day)]x[8.345 (lb/gal)]x[effluent temperature (°F)-receiving water temperature (°F)]
or
[flow (gal/day)]x[8.345 (lb/gal)]x[effluent temperature (°C)-receiving water temperature (°C)]x1.8

B. Water Quality Criteria

The following Idaho water quality criteria are applicable to pollutants of concern for the Portneuf River:

IDAPA 16.01.02.051.01	Antidegredation
IDAPA 16.01.02.060	Mixing Zone
IDAPA 16.01.02.200.01	Hazardous Materials
IDAPA 16.01.02.200.02	Toxic Substances
IDAPA 16.01.02.200.03	Deleterious Materials
IDAPA 16.01.02.200.04	Radioactive Materials
IDAPA 16.01.02.200.05	Floating, Suspended, or Submerged Matter
IDAPA 16.01.02.200.06	Excess Nutrients
IDAPA 16.01.02.200.07	Oxygen-Demanding Materials
IDAPA 16.01.02.200.08	Sediment
IDAPA 16.01.02.250.01.c	Secondary Contact Recreation (toxic substance criteria)

IDAPA 16.01.02.250.02.a	Aquatic Life (Hydrogen Ion Concentration (pH), total residual chlorine, dissolved gas, toxic substance criteria)
IDAPA 16.01.02.250.02.c	Cold Water Biota (dissolved oxygen, temperature, ammonia, and turbidity)
IDAPA 16.01.02.250.02.d	Salmonid Spawning (dissolved oxygen, temperature, ammonia)
IDAPA 16.01.02.250.03.b	Agricultural Water Supply
IDAPA 16.01.02.400	Rules Governing Point Source Discharges
IDAPA 16.01.02.400.03	Compliance Schedules
IDAPA 16.01.02.401.03	Treatment Requirements for Point Source Wastewaters (temperature, turbidity)

C. Mixing Zone

The Idaho water quality standards allow twenty-five percent (25%) of the receiving water volume to be used for dilution in aquatic life calculations and 100% of the receiving water volume to be used for dilution in human health and agriculture calculations. In accordance with Idaho water quality standards, only the IDEQ may authorize mixing zones of any size. If the State does not authorize a mixing zone in its 401 certification, the reasonable potential determination and permit limits will be re-calculated for the final permit to ensure compliance with the standards at the point of discharge.

The following pollutants used the default mixing zone to determine reasonable potential: cadmium, copper, cyanide (WAD), fluoride, gross alpha radiation, molybdenum, radium-226+radium-228, selenium, thallium, and total residual chlorine. If the State specifies a mixing zone other than the default for any pollutant, the reasonable potential determination and permit limits will be re-calculated for the final permit to ensure compliance with the standards at the edge of the mixing zone.

D. Evaluation of Effluent Limitations

1. Biochemical Oxygen Demand, 5-day (BOD_5). BOD_5 is the five-day measure of the dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in water. The Idaho water quality standards do not specifically limit BOD_5, however, the State standard does require that surface waters of the United States within Idaho shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition.

   Data collected from the facility indicates that the maximum BOD_5 concentration in their effluent is <2 mg/L, which would decrease dissolved oxygen (DO) in the receiving water by undetectable amounts (estimated using Sreeter-Phelps model). Since the limited data available indicates that Idaho water quality standards have not been violated nor have the potential to violate and organic depletion of oxygen is not inherent in this waste stream, no limit for BOD_5 is imposed on the facility.

   No limit for BOD_5 is proposed in the draft permit.

2. Chemical Oxygen Demand (COD). COD is the measure of the total organic content of a waste which can be oxidized. The Idaho water quality standards do not specifically limit COD, however, the State standard does require that surface waters of the United States within Idaho shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition.

   Data collected from the facility indicates that the maximum COD concentration in their effluent is 56 mg/L, which would decrease dissolved oxygen (DO) in the receiving water by undetectable amounts. Since the limited data available indicates that Idaho water quality standards have not been violated nor have the potential for violation, no limit for COD is imposed on the facility.

   No limit for COD is proposed in the draft permit.

3. Chlorine, Total Residual. The Idaho water quality standards require no toxics in toxic amounts. Residual chlorine compounds in the effluent can be toxic to aquatic life. The water quality criterion for aquatic life requires an acute limit of 0.019 mg/L and a chronic limit of 0.011 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). A mixing zone was not used in the analysis since the upstream concentration exceeded the

criterion. Since reasonable potential was determined, a limit has been imposed on the effluent.

The proposed limits for total residual chlorine are below the method detection limit[1] (MDL) of 0.100 mg/L for the DPD method cited in 40 CFR 136. When the effluent limit falls below the MDL, EPA Region 10 has adopted guidance in which: 1) the water quality based effluent limits are incorporated into the permit, and 2) the minimum level[2] ML will be used as the compliance evaluation level. Therefore, 0.100 mg/L is the final compliance evaluation level for total residual chlorine. The data set shows that the facility will be able to comply with these limits.

The draft permit is proposing an average monthly limit of 6 µg/L (0.11 lbs/day) and a maximum daily limit of 19 µg/L (0.36 lbs/day). However, the final compliance evaluation level will be 100 µg/L (1.9 lbs/day).

4. Cyanide (Weak Acid Dissociable). The Idaho water quality standards require no toxics in toxic amounts. The water quality criterion for aquatic life requires an acute limit of 0.022 mg/L and a chronic limit of 0.0052 mg/L. The water quality criterion for human health recreation requires a limit of 220 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). The data provided was for total cyanide, therefore, it was assumed that all the cyanide would be dissociable. Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

   The draft permit proposes a maximum daily limit of 16.7 µg/L (0.32 lb/day) and an average monthly limit of 4.0 µg/L (0.08 lb/day).

5. Dissolved Oxygen (DO). The Idaho water quality standards require surface waters of the United States within Idaho shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition. The water quality criterion for cold water biota and salmonid spawning give a DO limit of 6 mg/L. Data collected from RCRA in 1993 and FMC between August 1998 and January 1999 indicate that the

---

[1]The method detection limit is the minimum concentration that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero.

[2]The minimum level (ML) is defined as the lowest concentration that gives recognizable signals and an acceptable calibration point.

facility has met this standard and therefore a DO limit is not imposed on the facility.

No limit for DO is proposed in the draft permit.

6. Fecal Coliform Bacteria. The water quality criterion for secondary contact recreation require the following limits: 800 colonies per 100 milliliters at any time, 400 colonies per 100 milliliters in more than ten percent of the total samples taken over a thirty day period, and a geometric mean of 200 colonies per 100 milliliters based on a minimum of five samples taken over a thirty day period. Data collected from the facility indicate that fecal coliform are present at levels less than 70 colonies per 100 milliliters. Since the limited data available indicates that Idaho water quality standards have not been violated nor have the potential for violation, no limit for fecal coliform is imposed on the facility.

   No limit for fecal coliform bacteria is proposed in the draft permit.

7. Fluoride (F). The Idaho water quality standards require no toxics in toxic amounts. The water quality criterion for agricultural irrigation requires a limit of 1.0 mg/L and agricultural livestock requires a limit of 2.0 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent. The data set shows that the facility will be able to comply with these limits.

   The draft permit proposes a maximum daily limit of 17 mg/L (323 lb/day) and an average monthly limit of 4.3 mg/L (81 lb/day).

8. Metals. The Idaho water quality standards require no toxics in toxic amounts. Metals in certain concentrations can be toxic to aquatic life, livestock, plant life, and human health. Aluminum, antimony, arsenic, barium, beryllium, boron, bromide, cadmium, chromium(III), chromium(VI), cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, uranium, vanadium, and zinc were indicated as present because of previous analyses that were performed on the plant effluent. Analysis of the data indicated that aluminum, antimony, arsenic, beryllium, boron, chromium(III), chromium(VI), cobalt, iron, lithium, manganese, molybdenum, nickel, thallium, and vanadium did not provided a reasonable potential to violate water quality standards (See Appendix C) and limits are not proposed in the draft permit. There are no water quality criterion for barium, bromide, magnesium, strontium, and uranium.

a. Cadmium (Cd). The water quality criterion for aquatic life requires an acute limit of 12 µg/L and a chronic limit of 2 µg/L. The water quality criterion for agricultural irrigation requires a limit of 10 µg/L and agricultural livestock requires a limit of 50 µg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

The draft permit proposes a maximum daily limit of 3 µg/L (0.06 lb/day) and an average monthly limit of 1 µg/L (0.02 lb/day). However, the final compliance evaluation level for the monthly average will be 2 µg/L (0.04 lbs/day).

b. Copper (Cu). The water quality criterion for aquatic life requires an acute limit of 23 µg/L and a chronic limit of 15 µg/L. The water quality criterion for agricultural irrigation requires a limit of 0.200 mg/L and agricultural livestock requires a limit of 0.500 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

The draft permit proposes a maximum daily limit of 29.8 mg/L (0.57 lb/day) and an average monthly limit of 15.8 mg/L (0.3 lb/day).

c. Lead (Pb). The water quality criterion for aquatic life requires an acute limit of 91 µg/L and a chronic limit of 4 µg/L. The water quality criterion for agricultural irrigation requires a limit of 0.100 mg/L and agricultural livestock requires a limit of 5 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

The draft permit proposes a maximum daily limit of 11.5 µg/L (0.22 lb/day) and an average monthly limit of 2.5 µg/L (0.05 lb/day).

d. Mercury (Hg). The water quality criterion for aquatic life requires an acute limit of 2.0 µg/L and a chronic limit of 0.012 µg/L. The water quality criterion for human health recreation requires a limit of 0.15 µg/L. The water quality criterion for agricultural livestock requires a limit of 10 µg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Reasonable potential was determined based on the data provided by the facility. A closer look at the data showed that there was no detection except for the September 16, 1998 sample. Since there was detection on both the receiving water sample and the effluent sample, EPA believes this to be lab contamination. Therefore, no limit will be imposed on the facility.

No limit for mercury is proposed in the draft permit.

e. Selenium (Se). The water quality criterion for aquatic life requires an acute limit of 20 µg/L and a chronic limit of 5 µg/L. The water quality criterion for agricultural irrigation requires a limit of 20 µg/L and agricultural livestock requires a limit of 50 µg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

The draft permit proposes a maximum daily limit of 12.2 µg/L (0.23 lb/day) and an average monthly limit of 3.7 µg/L (0.07 lb/day). However, the final compliance evaluation level for the monthly average will be 5 µg/L (0.1 lbs/day).

f. Silver (Ag). The water quality criterion for aquatic life requires an acute limit of 6 µg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

The draft permit proposes a maximum daily limit of 9.7 µg/L (0.19 lb/day) and an average monthly limit of 2.9 µg/L (0.06 lb/day).

g. Zinc (Zn). The water quality criterion for aquatic life requires an acute limit of 149 µg/L and a chronic limit of 139 µg/L. The water quality criterion for agricultural irrigation requires a limit 2 mg/L and agricultural livestock requires a limit of 25 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will be able to comply with these limits.

The draft permit proposes a maximum daily limit of 192 µg/L (3.65 lb/day) and an average monthly limit of 79.1 µg/L (1.51 lb/day).

9. Nutrients.

Idaho water quality standards require that surface waters of the United States within Idaho shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. Nutrients consist of phosphorus, nitrogen and carbon compounds. Nitrogen and phosphorus compounds are particularly harmful since they enhance eutrophication and stimulate undesirable algae growth.

The Portneuf River has been designated as limited for nutrients. The TMDL will address the nutrients of total inorganic nitrogen and phosphorus and will provide waste load allocations for these pollutants. At present, it is not clear whether nitrogen or phosphorus is a limiting nutrient because concentrations of both elements in the Portneuf River are well above the accepted saturation levels.

a. Ammonia (as Nitrogen). Idaho criterion for ammonia are based on calculations that take into account water temperature and pH. It is EPA policy to use the 95th percentile of temperature and pH data for the receiving waterbody to determine the criterion for ammonia. Therefore, the water quality criterion for aquatic life requires an acute limit of 1.33 mg/L and a chronic limit of 0.24 mg/L based on a temperature of 20°C and pH of 8.7.

An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of chronic aquatic life. The data set shows that the facility will not be able to comply with the proposed limits and may need to evaluate means of decreasing the pollutant load in their effluent.

The draft permit proposes a maximum daily limit of 0.35 mg/L (6.71 lb/day) and a monthly average limit of 0.08 mg/L (1.44 lb/day).

b. Nitrate+Nitrite (as Nitrogen). The water quality criterion for agricultural livestock requires a limit of 0.100 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since reasonable potential was determined, a limit has been imposed on the effluent based on the most limiting criterion of agricultural livestock. The data set shows that the facility will not be able to comply with the proposed limits and may need to evaluate means of decreasing the pollutant load in their effluent.

The draft permit proposes a maximum daily limit of 0.15 mg/L (2.87 lb/day) and an average monthly limit of 0.10 mg/L (1.9 lb/day).

c. Total Inorganic Nitrogen (TIN). The Idaho water quality standards do not specifically limit TIN, however, the State standard does require that surface waters of the United States within Idaho shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses. TIN is the combination of ammonia, nitrates and nitrites. This is the form of nitrogen that is proposed for limitation in the TMDL. Combination of the proposed ammonia loading and the proposed nitrate+nitrite loading result in a TIN loading of 0.78 tons per year. Since the state is using TIN in the draft TMDL for the Portneuf River, the draft permit is proposing that the facility begin monitoring this pollutant.

No limit is proposed for TIN in the draft permit.

d. Orthophosphate (PO_4 as Phosphorus). The Idaho water quality standards do not specifically limit orthophosphate, however, the State standard does require that surface waters of the United States within Idaho shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.

To prevent the development of biological nuisances and to control accelerated or cultural eutrophication, total phosphates as phosphorus should not exceed 50 µg/L in any stream at the point where it enters any lake or reservoir (EPA, 1987). Since the Portneuf River is impaired for nutrients, this criterion is applied to the permittees effluent at the point of discharge. The data set shows that the facility will not be able to comply with the proposed limits and may need to evaluate means of decreasing the pollutant load in their effluent.

The draft permit proposes a maximum daily limit of 90 µg/L (1.71 lb/day) and an average monthly limit of 35 µg/L (0.66 lb/day).

e. Elemental Phosphorus (P_4). The Idaho water quality standards do not specifically limit elemental phosphorus, however, the State standard does require no toxics in toxic amounts. Phosphorus in the elemental form is particularly toxic and is subject to bioaccumulation in much the same way as mercury (EPA, 1987). Colloidal elemental phosphorus will poison marine fish causing skin tissue breakdown and discoloration. Also, phosphorus is capable of being concentrated and will accumulate in organs and soft tissues.

Experiments have shown that marine fish will concentrate phosphorus from water containing as little as 10 µg/L. While elemental phosphorus in sparingly soluble in water (3 ppm), it is toxic to aquatic animals at concentrations well below its solubility limit. Therefore, EPA recommends a criterion of 0.10 µg/L for elemental phosphorus.

Since the effluent is noncontact cooling water, not process water, there is no reason for elemental phosphorus to be present in the discharge. However, there has been past occurrences of process water infiltrating the noncontact cooling water system resulting in unpermitted discharges of elemental phosphorus. Therefore, the draft permit is proposing that the permittee conduct monitoring for this pollutant to ensure that there is no discharge. A trigger point of 0.10 µg/L will be used to initiate an investigation by the permittee.

The draft permit is proposing a maximum daily limit of 0.10 µg/L as a trigger point to initiate an investigation.

f. Total Phosphorus as P. The Idaho water quality standards do not specifically limit total phosphorus, however, the State standard does require that surface waters of the United States within Idaho shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.

A desired goal for the prevention of plant nuisances in streams or other flowing waters not discharging directly to lakes or impoundments is 100 µg/L total P (EPA, 1987). Since the Portneuf River is impaired for nutrients, this criterion is applied to the permittees effluent at the point of discharge. The data set shows that the facility will not be able to comply with the proposed limits and may need to evaluate means of decreasing the pollutant load in their effluent.

The draft permit proposes a maximum daily limit of 180 µg/L (3.43 lb/day) and an average monthly limit of 70 µg/L (1.32 lb/day).

10. Oil and Grease. The Idaho water quality standards require surface waters of the state to be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This includes any petroleum products that cause a sheen or coating on the water surface. EPA staff have noted that wash down operations in the furnace building are discharged through a drain in the basement that is connected to the noncontact cooling water system. The washdown water contains oils and grease that have caused enough trouble that the facility has installed a boom and skimmer to try and contain it.

    The draft permit proposes that the facility meet a narrative standard for floating, suspended or submerged matter.

11. Other Drugs, Chemicals, or Medications. The discharge of any drugs, chemicals, or medications in toxic amounts is prohibited pursuant to Section 101(a)(3) of the CWA and the Idaho water quality standards, which prohibits the discharge of toxic pollutants in toxic amounts.

    The draft permit is proposing that there shall be no discharge of any waste streams, including spills and other unintentional or non-routine discharges of pollutants, that are not part of the normal operation of the facility as disclosed in the permit application, or any pollutants that are not ordinarily present in such waste streams.

12. pH. The Idaho water quality standards for protection of aquatic life gives an allowable pH range of 6.5 to 9.5 standard units. The data set shows

that the facility will be able to comply with these limits. Since ammonia is a function of pH (ammonia is more lethal with a higher pH) and is a proposed limited parameter for this effluent, pH is also being included as a proposed monitoring parameter.

No limit for phenols is proposed in the draft permit.

13. Phenols. The Idaho water quality standards require no toxics in toxic amounts. The water quality criterion for human health recreation requires a limit of 4,600 mg/L. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since the data indicates that Idaho water quality standards have not been violated nor have the potential for violation, no limit for phenols is imposed on the facility.

    No limit for phenols is proposed in the draft permit.

14. Radioactivity. The Idaho water quality standards require that radioactive materials or radioactivity not exceed levels required in the federal Standards for Protection Against Radiation (10 CFR Part 20). Even though these regulations are for facilities licenced with the Nuclear Regulatory Commission (NRC), they apply to this facility through citation in Idaho water quality standards. The pollutants of concern are lead-210, polonium-210, radium-226, and radium-228.

    The main concern with radiation is human exposure to radiation through human consumption of foodstuffs harvested from the Portneuf River. Additionally, the Portneuf River is designated for agricultural use (irrigation of crops and raising of livestock). To protect human consumption of harvested foodstuffs (i.e., fish, crops, livestock), the State standards require that the Federal Drinking Water Standards (40 CFR Part 141) are used in assessing reasonable potential for radioactivity.

    The water quality criterion for agricultural irrigation and agricultural livestock requires a limit of 15 pCi/L for gross alpha radiation and a limit of 5 pCi/L for radium-226 plus radium-228. The water quality criterion for human health requires a limit of 10 pCi/L for lead-210, 40 pCi/L for polonium-210, 60 pCi/L for radium-226, and 60 pCi/L for radium-228. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since the data indicates that Idaho water quality standards have not been violated nor have the potential for violation, no limit for phenols is imposed on the facility.

No limit for radiation is proposed in the draft permit.

15. Solids.

a. Total Suspended Solids (TSS) and Turbidity. The Idaho water quality standards state that sediment shall not exceed quantities which impair designated beneficial uses and require surface waters of the State to be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses.

Suspended solids are organic and inorganic particulate matter in water. Turbidity of water is related to the amount of suspended and colloidal matter contained in the water. It is a measure of the clearness and penetration of light in water and an indirect measure of suspended solids.

Solids in suspension can be aesthetically displeasing and interfere with recreational use. They may also kill fish by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids cause adverse effects to aquatic life because they screen out light and promote the development of noxious conditions through oxygen depletion.

Identifiable effects of suspended solids on irrigation use of water include the formation of crusts on top of the soil, the formation of films on plant leaves, and cause interference with irrigation diversion equipment. When suspended solids form crusts on top of the soil, the crust inhibits water infiltration, plant emergence, and soil aeration. The formation of films on plant leaves blocks the sunlight and impedes plant growth.

When suspended solids become settleable, they deposit on the bed of the waterbody. This can cause damage to the invertebrate populations, block gravel spawning beds, and remove dissolved oxygen from overlying waters.

Suspended solids can also cause near surface wasters to become heated because of the greater heat absorbency of the particulate material. This tends to stabilize the water column and prevent vertical mixing which decreases the dispersion of dissolved oxygen and nutrients to lower portions of the waterbody.

The water quality criterion for aquatic life states that turbidity shall not exceed background turbidity by more than fifty NTU instantaneously or more than twenty-five NTU for more than ten consecutive days. The water quality criterion for point source discharges states that effluent turbidity below fifty NTU shall not increase the background turbidity by more than five NTU and effluent turbidity above fifty NTU shall not increase the background turbidity by more than ten percent or 25 NTU, whichever is less.

An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). Since the data indicates that Idaho water quality standards have not been violated nor have the potential for violation, no limit for turbidity is imposed on the facility.

The draft permit is proposing that there shall be no discharge of floating solids or visible foam in other than trace amounts. This requirement was a condition of the current permit and will be retained in the proposed permit.

b. Total Dissolved Solids (TDS). The Idaho water quality standards do not specifically limit TDS, however, the State standards do require that surface waters of the state shall be free from deleterious materials in concentrations that impair designated beneficial uses.

Total dissolved solids consist of inorganic salts, small amounts of organic matter, and dissolved materials. The principle inorganic anions dissolved in water include the carbonates, chlorides, sulfates, and nitrates whereas the principle cations are sodium, potassium, calcium, and magnesium.

Fish species and other aquatic life are tolerant of various ranges of dissolved solids concentration, depending on the species. Studies have shown that several common freshwater species survived in waters with 5,000 to 10,000 mg/L dissolved solids (EPA,1981). Dissolved solids may influence the toxicity of heavy metals and organic compounds to fish and other aquatic life, primarily because of the antagonistic effect of hardness on metals. Since the maximum effluent concentration measured was 3.25 mg/L and the maximum receiving water concentration measured was 404 mg/L, dissolved solids is not a concern for aquatic life.

Agricultural uses are also limited by excessive dissolved solids concentrations. They can cause harm to plant life because the rapid salinity changes will affect the osmotic effect leading to plasmolysis. Livestock can also be affected when dissolved solid concentrations reach 5,000 mg/L in highly alkaline waters. However, the concentrations in the Portneuf River are below the level for water where no detrimental effects will usually be noticed (500 mg/L). Therefore, dissolved solids are not a concern for agricultural livestock and irrigation.

No limit for total dissolved solids is proposed in the draft permit.

16. Specific Conductance. Specific conductance is a measure of the capacity of water to convey an electric current. This property is related to the total concentration of ionized substances in water and water temperature. Specific conductance is frequently used as a substitute method of quickly estimating the dissolved solids concentration in water. (See Solids, Total Dissolved Solids).

    No limit for specific conductance is proposed in the draft permit.

17. Sulfates. Sulfates are derived from the oxidation of sulfites and can exert chemical oxygen demand on receiving waters. Sulfates are not particularly harmful, but are a major constituent of the total dissolved solids in wastewaters from this industry. (See Solids, Total Dissolved Solids).

    No limit for sulfates is proposed in the draft permit.

18. Temperature. Since the nature of this discharge is cooling water, only the effects of heated water will be discussed in this fact sheet. Temperature can be influential in determining which aquatic species are present in a waterbody. When cold water biota are attracted to heated water in winter months, fish mortality may result when the fish return to cooler waters.

    Increased temperature can change reproduction cycles and may inhibit spawning. It can also cause migration of competitors, predators, parasites, and disease that can destroy a species at levels far below those that are lethal. Thus, a fish population may exist in a heated area only by continued immigration.

    The water quality criterion for aquatic life requires a maximum daily limit of 22°C and an average daily limit of 19°C. The water quality criterion for salmonid spawning (Cutthrout Trout identified as present by NMFS) requires a maximum daily limit of 13°C and an average daily limit of 9°C. An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards. Since reasonable potential was determined, a limit has been imposed on the effluent (See Appendix C). The data set shows that the facility will not be able to comply with the proposed limits and may need to evaluate means of decreasing the pollutant load in their effluent.

The draft permit proposes the following limits: a maximum daily temperature of 21°C ($1.0x10^8$ BTU/day) and an average daily temperature of 19°C from August 2 through March 31; and a maximum daily temperature of 13°C (0 BTU/day) and an average daily temperature of 9°C from April 1 through August 1.

19. Whole Effluent Toxicity (WET). Whole effluent toxicity is a useful parameter for assessing and protecting against impacts upon water quality and designated uses caused by the aggregate toxic effect of the discharge of pollutants. The Idaho water quality standards require no toxics in toxic amounts. Even though the State standards do not specifically limit WET, EPA recommends that magnitudes for whole effluent toxicity are as follows: for acute protection, the criterion should be set at 0.3 acute toxic unit (TU_a); and for chronic protection, the criterion should be set at 1.0 chronic toxic unit (TU_c).

    An analysis was performed to determine if this pollutant had reasonable potential to violate water quality standards (See Appendix C). One data report had an interrupted dose response of 50% (2.0 TU_c), but all others were at 100% (1.0 TU_c). The reasonable potential analysis indicates that there is a potential for violation of water quality standards because a coefficient of variation (CV) of 0.6 was used in the analysis. Whenever there is less than ten data points, it is EPA's policy to use a default CV of 0.6. This CV is indicative of a high variation in the data set, however, the data set did not appear to be that variable. Thus, EPA would like more data concerning this parameter.

    The draft permit proposes that quarterly WET testing be conducted in the first year. If no toxicity is present, then quarterly sampling would be conducted in the fourth year. Otherwise, quarterly sampling would be conducted each year.

E. Antidegradation

In proposing to reissue this permit, EPA has considered Idaho's antidegradation policy. This provision states that "the existing instream water uses and the level of water quality necessary to protect the existing uses will be maintained and protected." This policy is designed to protect existing water quality when the existing quality is better than that required to meet the standard and to prevent water quality from being degraded below the standard when existing quality just meets the standard. The draft permit will result in decreases in the authorized pollutant loadings to Paradise Creek. Therefore, the draft permit will not result in degradation of water quality and is consistent with Idaho's antidegradation policy.

F. Compliance Schedules

The State of Idaho allows compliance schedules for point source discharges which allow a discharger to phase-in, over time, compliance with water quality-based effluent limitations when new limitations are in the permit for the first time. Compliance schedules are limited to five years or the life of the permit. If the State does not authorize a compliance schedule in the 401 certification, none will be given in the final permit and compliance with effluent limits will commence on the effective date of the permit.

IV. EFFLUENT MONITORING REQUIREMENTS

In addition to providing water quality-based limits, monitoring requirements must be included in the permit to determine compliance with effluent limitations (section 308 of the CWA and 40 CFR Part 122.44[i]). Additional monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. The permittee is responsible for conducting the monitoring and for reporting results to EPA.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Table IV-1 presents the monitoring requirements for the draft permit. For comparison purposes, the table also shows the monitoring requirements of the current permit. Where the requirements differ, a discussion will be provided in the table notes.

TABLE IV-1: MONITORING FREQUENCY REQUIREMENTS			
PARAMETER	UNITS	CURRENT PERMIT (1982)	DRAFT PERMIT (1999)
Ammonia	mg/L	NR[1]	4/month
Cadmium (Cd)	µg/L	NR	4/month
Chlorine, Total Residual	µg/L	NR	4/month
Copper (Cu)	µg/L	NR	4/month
Cyanide (WAD)	µg/L	NR	4/month
Elemental Phosphorus	µg/L	NR	4/month
Flow	mgd	continuous	continuous
Fluoride (F)	mg/L	NR	4/month
Hardness as $CaCO_3$	mg/L	NR	4/month
Lead (Pb)	µg/L	NR	4/month
Nitrate+Nitrite as N	mg/L	NR	4/month
Orthophosphate as P	µg/L	NR	4/month
pH	s.u.	NR	4/month
Selenium (Se)	µg/L	NR	4/month
Temperature	°C	continuous	continuous
Total Inorganic Nitrogen (TIN)	mg/L	NR	4/month
Total Phosphorus as P	mg/L	NR	4/month
Whole Effluent Toxicity	TUc	NR	1/quarter[2]
Zinc (Zn)	µg/L	NR	4/month

1 NR means not required.
2 If no toxicity is determined, monitoring is only required during the first and fourth years.

V. AMBIENT MONITORING

The purpose of water quality monitoring of the receiving (ambient) water body is to determine water quality conditions as part of the effort to evaluate the reasonable potential for the discharge to cause an instream excursion above water quality criteria (40 CFR part 122.44). Upstream monitoring is necessary to obtain the appropriate data to use in reasonable potential analysis (See equation 1 in Appendix C). Downstream monitoring is used to gain a better understanding of pollutant concentrations at the edge of the potential mixing zone in order to ensure that designated uses are being protected. The proposed ambient monitoring requirements for the draft permit are provided in Table V-1.

TABLE I-3: AMBIENT MONITORING REQUIREMENTS				
Effluent Parameter	Units	Sample Frequency	Sample Location	Sample Type
Ammonia as N	mg/L	1/month	upstream & downstream	grab
Cadmium	µg/L	1/month	upstream & downstream	grab
Chlorine, total residual	µg/L	1/month	upstream & downstream	grab
Copper	µg/L	1/month	upstream & downstream	grab
Cyanide (WAD)	µg/L	1/month	upstream & downstream	grab
Elemental Phosphorus	µg/L	1/month	upstream & downstream	grab
Flow	mgd	continuous	upstream	recording
Fluoride	mg/L	1/month	upstream & downstream	grab
Hardness as $CaCO_3$	mg/L	1/month	upstream	grab
Lead	µg/L	1/month	upstream & downstream	grab
Nitrate+Nitrite	mg/L	1/month	upstream & downstream	grab
Orthophosphate as P	µg/L	1/month	upstream & downstream	grab
pH	s.u.	1/month	upstream & downstream	grab
Selenium	µg/L	1/month	upstream & downstream	grab
Silver	µg/L	1/month	upstream & downstream	grab
Temperature	°C	continuous	upstream	recording
TIN	mg/L	1/month	upstream & downstream	grab
Total Phosphorus as P	µg/L	1/month	upstream & downstream	grab
Zinc	µg/L	1/month	upstream & downstream	grab

VI. SPECIAL CONDITIONS

A. Quality Assurance Project Plan (QAPP)

Under 40 CFR Part 122.41(e), the permittee is required to ensure adequate laboratory controls and appropriate quality assurance procedures in order to properly operate and maintain all facilities which it uses. In their current permit, the facility was required to develop a QAPP that would assist in planning for the collection and analysis of samples in support of the permit and in explaining data anomalies when they occur. EPA reviewed and approved the QAPP submitted August 24, 1992. The proposed permit requires the facility to review their plan at least every five years and update the QAPP, if applicable.

B. Best Management Practices (BMPs)

It is the national policy that, whenever feasible, pollution should be prevented or reduced at the source, that pollution which cannot be prevented should be recycled in an environmentally safe manner, that pollution which cannot be prevented or recycled should be treated in an environmentally safe manner, and that disposal or release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner (Pollution Prevention Act of 1990, 42 U.S.C. § 13101 et seq.). This policy and 40 CFR Part 122.44(k) form the basis for the draft permit requirement that the permittee develop and implement a BMPs operating plan.

BMPs are practices that are designed to minimize the volume of pollutants that must be treated. In developing its BMPs operating plan, the permittee will analyze all processes and activities at the facility to determine the potential for a release of pollutants due to that activity and ways to minimize that potential.

The draft permit requires that the permittee develop a plan and implement BMPs within 180 days after receiving authorization to discharge under this permit. Additionally, the BMP operating plan must be amended whenever there is a change in the facility or in the operation of the facility which materially increases the potential for an increased discharge of pollutants.

VII . OTHER LEGAL REQUIREMENTS

A. Endangered Species Act (ESA)

Section 7(a) and (c) of the ESA requires federal agencies to request a consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) regarding potential effects an action may have on endangered species. Therefore, EPA requested a listing of threatened and endangered species in the vicinity of the City of Pocatello from NMFS and USFWS.

Letters from USFWS and NMFS dated September 18, 1998, and September 30, 1998, respectively, both indicated that there were no proposed, candidate or endangered anadromous fish species in the area of the proposed discharge. NMFS indicated that Snake River spring/summer and fall chinook salmon (Oncorhynchus tshawytscha), Snake River Sockeye salmon (Oncorhynchus nerka), and West Coast steelhead (Oncorhynchus mykiss) occur downstream in the Snake River basin below Hells Canyon Dam.

B. State Certification

Since this permit authorized discharge to Idaho State waters, the provisions of Section 401 of the CWA apply. Section 401 of the CWA requires that states certify that federally issued permits are in compliance with state law. No permits can be issued until the requirements of this section are satisfied.

EPA is requesting Idaho State officials to review and provide appropriate certification to this draft NPDES permit pursuant to 40 CFR Part 124.53. Furthermore, in accordance with 40 CFR Part 124.10(c)(1), public notice of the draft permit has been provided to the state of Idaho agencies having jurisdiction over fish, shellfish, and wildlife resources.

C. Permit Expiration

This permit will expire five years from the effective date of the permit.

D. Facility Changes or Alterations

The facility is required to notify EPA of any planned physical alteration or operational change to the facility in accordance with 40 CFR 122.41(1). This requirement has been incorporated into the proposed permit to insure that EPA and IDEQ are notified of any potential increases or changes in the amount of pollutants being discharged. This will allow evaluation of the impact of the pollutant loading on the receiving water.

VIII. REFERENCES

EPA. 1977. *Draft Supplement to Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Phosphorus Derived Chemicals Segment of the Phosphate Manufacturing Point Source Category.* U.S. Environmental Protection Agency, Office of Water and Hazardous Materials, October 1977.

EPA. 1987. *Quality Criteria for Water 1986.* U.S. Environmental Protection Agency, Office of Water, EPA 440/5-86-001, May 1, 1987.

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control.* U.S. Environmental Protection Agency, Office of Water, EPA\505\2-90-001, March 1991.

EPA. 1993. *Guidance Manual for Developing Best Management Practices (BMP).* U.S. Environmental Protection Agency, Office of Water, EPA/833/B-93-004, October 1993.

EPA. 1993. *Status of Detection Level Strategies*, U.S. Environmental Protection Agency, memo September 9, 1993.

EPA. 1996. *U.S. EPA NPDES Permit Writer's Manual*. U.S. Environmental Protection Agency, Office of Water, EPA/833/B-96-003, December 1996.

EPA. 1996. *EPA Region 10 Guidance for WQBELs Below Analytical Detection/Quantification Level*.

IDAPA. 1996. Idaho Administrative Procedures Act 16, Title 01, Chapter 02: *Water Quality Standards and Wastewater Treatment Requirements*.

IX. ACRONYMS

BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
BOD_5	Biochemical Oxygen Demand, five-day
°C	Degrees celcius
Cda	Acute criterion
Cdc	Chronic criterion
CFR	Code of Federal Regulations
cfu	Colony forming units
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
DPD	
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
gpm	Gallons per minute
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Division of Environmental Quality
lbs	Pounds
LC_{50}	Lethal concentration where 50% test organisms die
MDL	Method Detection Limit
mg/L	Milligrams per liter
mL	Milliliter
ML	Minimum Level
MWWTP	Moscow Waste Water Treatment Plant
N	Nitrogen
NMFS	National Marine Fisheries Service
NOEC	No observed effect concentration
NPDES	National Pollutant Discharge Elimitation System
NR	Not Required
OW	Office of Water
P	Phosphorus
PO_4	Orthophosphate
QAPP	Quality Assurance Project Plan
RWC	Receiving water concentration
sp.	Species
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TRC	Total Residual Chlorine
TSD	Technical Support Document (EPA, 1991)
TSS	Total Suspended Solids
TU_c	Chronic Toxic Units
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WET	Whole Effluent Toxicity

WLA	Waste Load Allocation
WQBEL	Water quality based effluent limit
yr	year

APPENDIX A

PROCESS DESCRIPTION

I. MANUFACTURING PROCESS

FMC produces approximately 250 million pounds of elemental phosphorus (white phosphorus) from about 1.4 million tons of phosphorus-containing shale ore per year. Elemental phosphorus is manufactured by the reduction of phosphate ore by coke in very large electric furnaces, using silica as a flux.

FMC mines and transports the shale ore to the facility where it is crushed, sized, and stockpiled. The process of phosphorus production is conducted in a three part process consisting of phosphate ore preparation, smelting in the electric furnace, and recovery of phosphorus. (See Figure A-1: Process Flow Diagram.)

A. Phosphate Ore Preparation

The phosphorus ore is washed and blended so that the furnace feed is of uniform composition. The ore is then dried and pressed into briquets using a continuous roll press and then sent to two continuous-grate kilns where the briquets are calcined into hardened "nodules". In the calcining process, the briquets are heated to its fusion point at temperatures ranging from 1,800 to 2,500°F and uniformly sized for more efficient heat transfer in the furnace. The sizing produces fines and dust that are recycled to the briquetting process. The calcining process also creates fumes from water, organic matter, carbon dioxide and fluorine. These fumes are scrubbed with water in primary and secondary scrubbers to remove the fluorine gasses as HF and H_2SiF_6.

B. Electric Furnace Operations

FMC uses four electric arc furnaces to extract the phosphorus from the ore. The nodules, coke, and sand (silica) are fed to each furnace by incrementally adding weighted quantities of these materials onto a conveyor belt. Penetrations in the furnace are for feed chutes, carbon electrodes, tap holes, slag (upper liquid layer), ferrophosphorus (lower liquid layer), and exhaust gases (CO and P_4). The furnace operates at temperatures up to 2,700°F to extract the phosphorus from the ore. The slag and ferrophosphorus are air cooled, broken into large chunks and stockpiled onsite.

There are numerous sources of fumes from the furnace operation. The feeding operation is a source of dust, and fumes are emitted from the electrode penetrations and tapping operations. The fumes, consisting of dust, phosphorus vapor, and carbon monoxide, are collected and scrubbed.

C. Recovery of Phosphorus

The hot furnace exhaust gases pass through an electrostatic precipitator to remove the dust prior to phosphorus condensation. The dust is slurried with water and pumped to a settling pond where the solids are recycled to the raw feed for recovery of phosphates and the clarified pond effluent is reused in the slurrying operation.

Downstream of the precipitator, the phosphorus is condensed in primary and secondary condensers using a hot water spray. The liquid phosphorus drains into a water sump where the water maintains a seal from the atmosphere. The water is partially neutralized with lime to minimize corrosion and then recirculated from the sump to the condensers. The condenser exhaust gasses are mainly carbon monoxide which is burned in a flare or utilized for heating elsewhere in the plant.

The liquid phosphorus is routed to the Phos dock for collection and storage for shipment. Liquid phosphorus is stored in steam-heated tanks under a water blanket and pumped to tank cars prior to shipping. The tank cars also have a protective blanket of water and are equipped with steam coils for remelting at the destination.

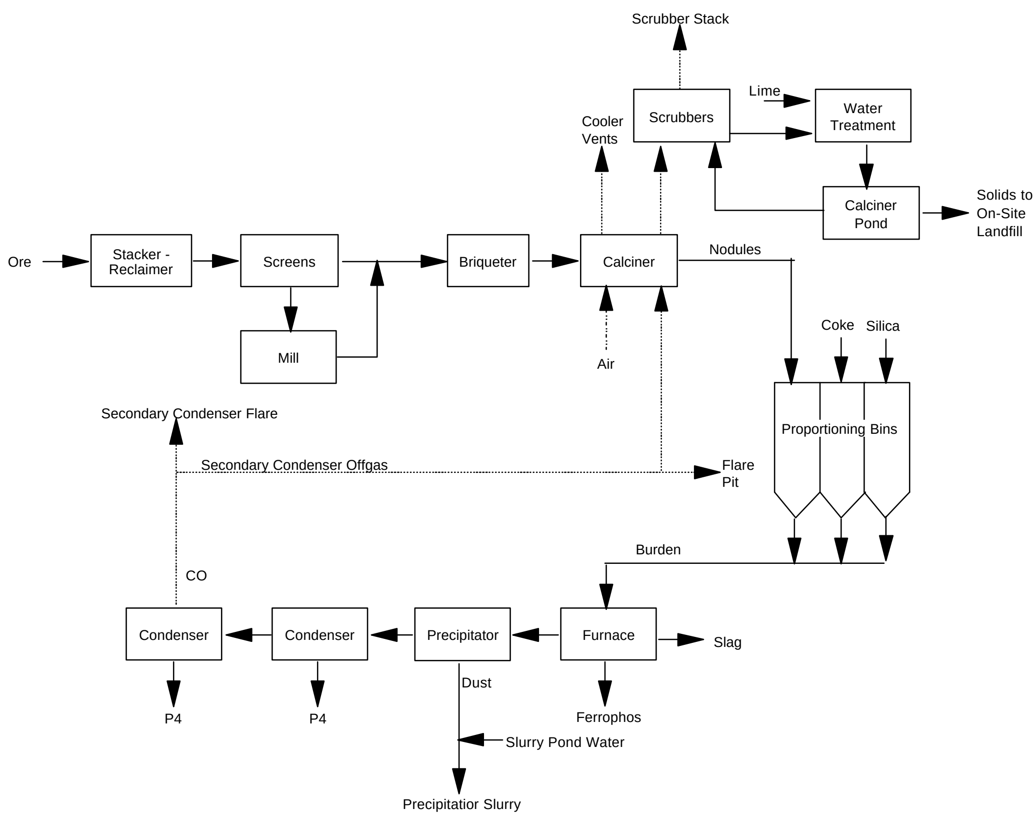


Figure A-1. Process Flow Diagram for FMC Corporation's Phosphorus Production Plant

II. WATER BALANCE

A. Specific Water Uses

Water is primarily used for the following purposes:

Non-Contact Cooling Water
Transport Water
Contact Cooling or Heating Water
Atmospheric Seal Water
Scrubber Water
Auxiliary Process Water
Miscellaneous Uses

The plant water balance shown in Figure A-2 is based upon a typical outfall rate of 1,800 gallons per minute (gpm).

Non-Contact Cooling Water. Water used without contacting the reactants, such as in a tube-in-shell heat exchanger, is not contaminated with process effluent. This wastewater consists of the following water streams in the plant:

- Non-contact cooling water from the calciner area including water beam cooling and fan bearing cooling waters;
- Non-contact cooling water from the furnace area including furnace dome, shell, and tapping hole cooling waters;
- Steam condensate collected from various sources throughout the plant; and
- Boiler feedwater treatment system blowdown and boiler blowdown waters.

The makeup water for all of these non-process wastewaters is groundwater from on-site production wells.

A portion of the non-contact cooling water is recycled back to the plant as cooling water while the majority is discharged to the NPDES outfall. The flow rate to the outfall is variable, ranging from 780 gpm to 2,070 gpm. The variation is due to the use of the effluent for landscape irrigation and road watering during the summer months. The effluent is cooled 2 to 5°F using an evaporative spray fountain located in the IWW pond.

It is estimated that the contributions to the outfall flow are:

Non-contact cooling water (1771 gpm)
Boiler blowdown water (8 gpm)

Steam condensate water (21 gpm)

Transport Water. Water used to transport reactants or products between unit operations (i.e., transferring liquid phosphorus to holding tanks, transferring precipitator dust in slurry to settling pond). This water is process water and is not discharged to the NPDES outfall.

Contact Cooling or Heating Water. The main sources of this water are from the condensation of the gaseous phosphorus after it is produced in the furnaces and water used to quench the slag from the furnaces. Other usage includes contact steam heating and/or drying, steam distillation, pump and furnace seals. This water is process water and is not discharged to the NPDES outfall.

Atmospheric Seal Water. Atmospheric seal water is used to prevent phosphorus from coming into contact with air since it is highly reactive and can spontaneously ignite upon contact with oxygen. Therefore, water is used to seal reaction vessels and as a water blanket on liquid phosphorus. This water is process water and is not discharged to the NPDES outfall.

Scrubber Water. Water scrubbers are used to remove process vapors and/or dusts from tail gases or from gaseous process streams. The used scrubber water is process water and is not discharged to the NPDES outfall.

Auxiliary Process Water. This water is used in auxiliary plant operations such as makeup water to boilers with resultant boiler blowdown, equipment washing, storage and shipping tank washing, and spill and leak washdown. The volume of wastewater from these operations is generally low in quantity, but highly concentrated in effluents.

Miscellaneous Water Uses. These water uses include floor washing and cleanup, safety showers and eye wash stations, sanitary uses, and storm run-off.

The plant sanitary wastewater system consists mainly of potable water with a few other minor flows, such as air conditioner condensate. The sanitary wastewater system discharges tot he Pocatello publicly Owned Treatment Works and is not discharged to the NPDES outfall.

Only stormwater associated with the industrial activity is managed by the facility. This includes precipitation that falls on storage piles, ponds, roads, parking lots and processing equipment. The majority of stormwater from these areas are collected in a stormwater pond which remains in balance through evaporation and percolation. The remainder of stormwater from these areas are collected and used in the scrubber water system or process water system. No stormwater is discharged to the NPDES outfall.

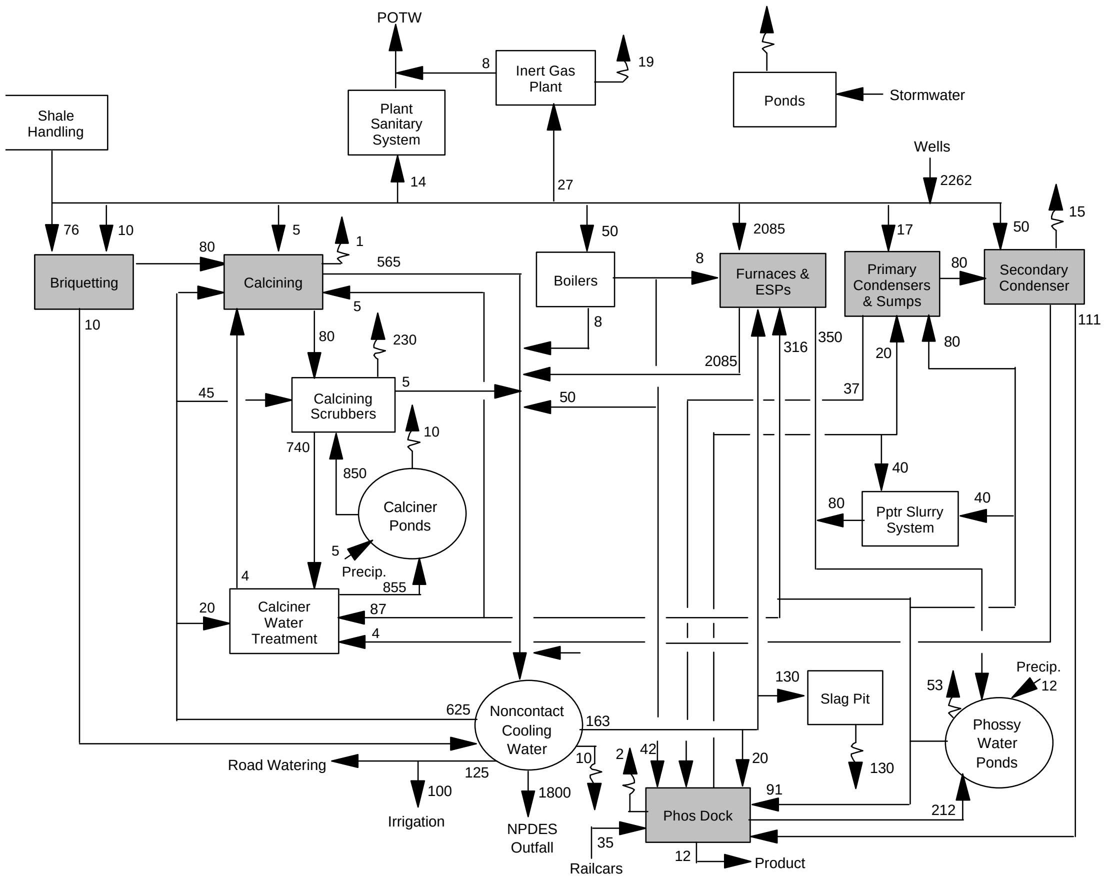
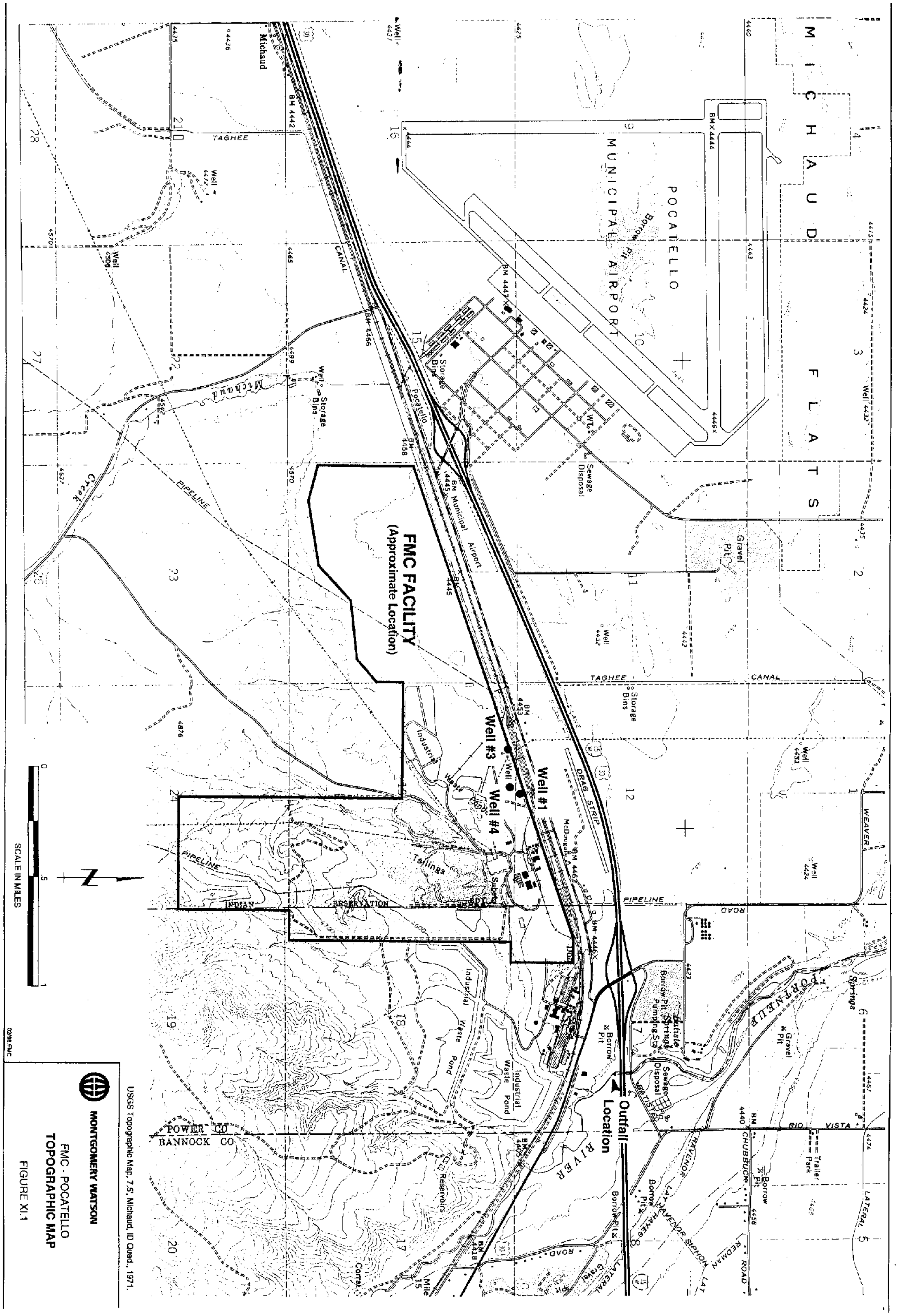


Figure A-2. Water Balance Diagram for FMC Corporation's Phosphorus Production Plant

APPENDIX B

MAP



FMC - POCATELLO
TOPOGRAPHIC MAP
FIGURE XI.1

APPENDIX C

CALCULATIONS

Calculations used to determine reasonable potential to violate water quality standards and develop permit limits were derived from EPA's Technical Support Document (EPA, 1991). For most pollutants, a model spreadsheet was used to perform the necessary calculations, however, others still required "hand calculations" be conducted. This appendix is comprised of the following: Section 1 provides the data used to perform the necessary calculations; Section 2 presents the calculations used in the model spreadsheet; and Section 3 contains any other calculations ("hand calculations").

This section discusses the calculations used in this spreadsheet model to determine reasonable potential, determine a wasteload allocation, and develop permit limits. In determining reasonable potential and water quality-based permit limits, this spreadsheet uses the steady-state model represented by the following equation:

$$Q_d C_d = Q_e C_e + Q_u C_u \qquad \text{[eqn. 1]}$$

where Q_d is the downstream receiving water flow (Q_e+Q_u), C_d is the downstream receiving water concentration, Q_e is the effluent flow, C_e is the effluent concentration, Q_u is the critical upstream receiving water flow with the allowed mixing, and C_u is the upstream receiving water concentration.

The critical upstream receiving water flow (Q_u) is dependant upon the critical flow and the allowed mixing:

$$Q_u = [critical \quad flow][allowed \quad mixing]. \qquad \text{[eqn. 2]}$$

The critical flows for the different criteria are: the 7Q10 flow is used when applying the chronic criterion, the 1Q10 is used when applying the acute criterion, the harmonic mean is used when applying the human health or agriculture carcinogenic criterion, and the 30Q5 is used when applying the human health or agriculture non-carcinogenic criterion.

The allowed mixing is either a percent of the critical flow or a dilution ratio (dilution:1), where dilution is expressed as:

$$dilution = \frac{Q_d}{Q_e} = \frac{\left(Q_e + [critical \quad flow][allowed \quad mixing]\right)}{Q_e}. \qquad \text{[eqn. 3]}$$

Since Q_u is dependant upon the critical flow and the allowed mixing, equation 3 can then be rearranged to determine Q_u:

$$Q_u = [critical \quad flow][allowed \quad mixing] = dilution \cdot Q_e - Q_e. \qquad \text{[eqn. 4]}$$

DETERMINING REASONABLE POTENTIAL

To determine reasonable potential, equation 1 is rearranged to solve for the projected downstream receiving water concentration (C_d):

$$C_d = \frac{\left(Q_e C_e + Q_u C_u\right)}{Q_d}. \qquad \text{[eqn. 5]}$$

In equation 5, C_e is derived using EPA's statistical approach in the following equation:

$$C_e = \frac{MEC \cdot RPM}{translator} \qquad \text{[eqn. 6]}$$

where MEC is the maximum effluent concentration, and RPM is the reasonable potential multiplier.

The RPM converts the MEC to the upper bounds of a lognormal distribution using a statistical analysis of the data set. The RPM is calculated in two parts. In the first part, the percentile (p_n) represented by the highest concentration in the data is computed using the following equation:

$$p_n = \left(1 - confidence\, level\right)^{1/n} \qquad \text{[eqn. 7]}$$

where the confidence level is 99 percent (0.99) and n is the number of data points. Then the reasonable potential multiplier (RPM) is determined from a relationship between the percentile and the selected upper bound of the lognormal effluent distribution. This relationship is given in the following equation:

$$RPM = \frac{C_{99}}{C_{p_n}} = \frac{\exp\left(2.326s - 0.5s^{2}\right)}{\exp\left(zs - 0.5s^{2}\right)} \qquad \text{[eqn. 8]}$$

where C_{99} is the statistical variability at an upper bound of 99 percent, C_{pn} is the statistical variability at the percentile (p_n), z is the statistical z-score at the percentile, $\sigma^2=\ln(CV^2+1)$, and CV is the ratio of the standard deviation to the mean. The RPM is then multiplied by the MEC to obtain the projected maximum value of effluent concentration (C_e):

$$C_e = MEC \cdot RPM\ . \qquad \text{[eqn. 9a]}$$

For criteria expressed as dissolved, a translator is necessary to compare total recoverable data with the dissolved criteria. A translator is the fraction of total recoverable metal in the downstream water that is dissolved. Default translators are the inverse of the conversion factor associated with the criteria. The state of Idaho has default translators for arsenic, cadmium, chromium(III), chromium(VI), copper, lead, mercury, nickel, silver, and zinc, however, site specific translators can be used in lieu of the default translators. When a translator is used, equation 9a is modified to:

$$C_e = \frac{RMP \cdot MEC}{translator} . \qquad \text{[eqn. 9b]}$$

Once C_e is determined, equation 5 can be used to project the downstream concentration (C_d). This projected downstream concentration is then compared to each criterion to determine if there may be an exceedance of the water quality standard. If there is reasonable potential, then a water quality-based permit limit is computed.

DETERMINING A WASTELOAD ALLOCATION

The wasteload allocation (WLA) is used to determine the level of effluent concentration that would comply with water quality standards in the receiving water. A WLA is determined only for parameters that have a reasonable potential to cause an exceedance of water quality standards. WLAs based on protecting aquatic life will have two results: acute and chronic requirements because Idaho water quality standards provide both acute and chronic protection for aquatic life. In contrast, WLAs based on protecting human health and agriculture will have only a chronic requirement. To determine WLAs, equation 1 is rearranged to solve for C_e:

$$WLA = C_e = \frac{C_d\left(Q_e + Q_u\right) - C_u Q_u}{Q_e} . \qquad \text{[eqn. 10a]}$$

In equation 10, the numeric criteria in the water quality standards are used as the desired downstream concentration (Q_d) to calculate effluent concentrations that would result in compliance with those standards.

For whole effluent toxicity (WET), the acute WLA is converted into an equivalent chronic WLA by multiplying the acute WLA by an acute-to-chronic ratio (ACR). The ACR is the relationship between acute toxicity and chronic toxicity ($ACR=LC_{50}/NOEC$). In this case, equation 10a is modified to:

$$WLA_{ac} = C_e \cdot ACR = \frac{C_d\left(Q_e + Q_u\right) - C_u Q_u}{Q_e} \cdot ACR . \qquad \text{[eqn. 10b]}$$

DERIVING A PERMIT LIMIT

AQUATIC LIFE

The WLA for aquatic life provides two numbers for protection against two types of toxic effects: acute and chronic. These requirements yield different effluent treatment requirements that cannot be compared to each other without calculating the long-term average (LTA) performance level the plant would need to maintain in order to meet each requirement. The acute LTA is calculated using the following equation:

$$LTA_{a,c} = WLA_a \cdot e^{[0.5s - zs]} \qquad \text{[eqn. 11]}$$

where $\sigma^2=\ln(CV^2+1)$ and z=2.326 for the 99th percentile probability basis. Likewise, the chronic LTA is calculated as follows:

$$LTA_c = WLA_c \cdot e^{\left[0.5s_4{}^2 - zs_4\right]} \qquad \text{[eqn. 12]}$$

where $\sigma_4{}^2=\ln(CV^2/4+1)$ and z=2.326 for the 99th percentile probability basis. Once the acute and chronic LTAs are computed, they are compared and the lowest one is selected for permit limit development since it is protective of both acute and chronic WLAs.

The NPDES regulations at 40 CFR Part 122.45(d) require that all permit limits be expressed, unless impracticable, as both average monthly limits (AMLs) and maximum daily limits (MDLs) for all discharges other than POTWs, and as average weekly limits (AWLs) and AMLs for POTWs. In lieu of an AWL for POTWs, EPA recommends establishing an MDL for water quality-based permitting to account for acute toxicity impacts. Therefore, the MDL and AML are computed as follows:

$$MDL = LTA \cdot e^{\left[zs - 0.5s^2\right]} \qquad \text{[eqn. 13]}$$

$$AML = LTA \cdot e^{\left[zs_n - 0.5s_n{}^2\right]} \qquad \text{[eqn. 14]}$$

where $\sigma^2=\ln(CV^2+1)$, $\sigma_n{}^2=\ln(CV^2/n+1)$, n is the number of samples required per month, and z=1.645 for the 95th percentile probability basis.

Equations 13 and 14 provide limits based on concentration, however the NPDES regulations at 40 CFR Part 122.45(f) require that all pollutants limited in permit shall have limitations expressed in terms of mass except for pH, temperature, radiation, or other pollutants which cannot appropriately be expressed by mass. Thus, the MDL and AML must be converted to mass loadings, when applicable, as follows:

$$\text{Maximum Daily Loading} = MDL \cdot Q_e \cdot 8.34 \quad \text{(lb/day)} \qquad \text{[eqn. 15]}$$

$$\text{Average Monthly Loading} = AML \cdot Q_e \cdot 8.34 \quad \text{(lb/day)} \qquad \text{[eqn. 16]}$$

where Q_e is in units of million gallons per day (mgd) and 8.34 is a conversion factor.

HUMAN HEALTH & AGRICULTURE

Determining permit limits for pollutants affecting human health is somewhat different from setting limits for other pollutants because the exposure period is generally longer than one month. If the procedures used for aquatic life protection were applied in the development permit limits for human health pollutants, both MDLs and AMLs would exceed the WLA. Therefore, the AML is set equal to the WLA and the MDL is computed as follows:

$$MDL = AML \cdot \frac{e^{\left[z_m s - 0.5 s^2\right]}}{e^{\left[z_a s_n - 0.5 s_n^2\right]}} \qquad \text{[eqn. 17]}$$

where $\sigma^2=\ln(CV^2+1)$, $\sigma_n^2=\ln(CV^2/n+1)$, n is the number of samples required per month, $z_m=2.326$ for the 99th percentile probability basis, and $z_a=1.645$ for the 95th percentile probability basis. The MDL and AML are then converted to mass loadings, when appropriate, using equations 15 and 16.

Flow Conditions

The flows used to evaluate compliance with the criteria are:

- The 1 day, 10 year low flow (1Q10) is used for the protection of aquatic life from acute effects. It represents the lowest daily flow that is expected to occur once in 10 years.

- The 7 day, 10 year low flow (7Q10) is used for the protection of aquatic life from chronic effects. It the lowest 7 day average flow expected to occur once in 10 years.

- The 30 day, 5 year low flow (30Q5) is used for the protection of human health from non-carcinogens. It represents the 30 day average flow expected to occur once in 5 years. For the period April 1 through September 30, the 30Q5 is also used for protection of agriculture.

- The harmonic mean flow is a long-term average flow and is used for the protection of human health from carcinogens. It is the number of daily flow measurements divided by the sum of the reciprocals of the flows. The harmonic mean was also used for the protection of agriculture year round.

The following table provides the flow information from the USGS guaging station at Pocatello that was used for reasonable potential analysis:

1Q10 (cfs)	7Q10 (cfs)	30Q5 (cfs)	Harmonic Mean (cfs)
6.92	13.19	34.88	122

SECTION 1 - DATA

EFFLUENT DATA									
	Aluminum (µg/L)	Ammonia (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Beryllium (µg/L)	BOD (mg/L)	BOD (lb/day)	Boron (µg/L)	Cadmium (µg/L)
STORET		460							
FMC Appl. 6/5/87	20	100	1	5	0.1	2		150	3.3
EPA Insp. 1993	300	0	5.5	6	0.5				1.4
FMC 1/6/94									
FMC 1/12/94									
FMC 1/19/94									
FMC 6/16/94			100		0				5
EPA Insp. 1994				6.6					
EPA 1997	58.4		20.2	10	0.4				1.1
EPA 1997				9.8					2.8
NEIC 1993			0	17	0				5
EPA 1993	0	0	0	6.86	0			162.19	1
EPA 1993	0		0	7.29	0			182.36	1
EPA 1993	0	0	0	6.79	0			178.82	3.07
EPA 1993	0	0	0	6.71	0			194.26	4.1
EPA 1993	0	0	0	7.39	0			181.45	1
EPA 1993	0	0	0	7.41	0			223.24	1
EPA 1993	0	0	0	6.57	0			187.44	2.8
EPA 1993	0	0	0	6.33	0			236.97	1
FMC Appl. 1998		300				2	50	148	
FMC 8/12/98									
FMC 8/26/98	0	0	0	10.9	0			171	1.2
FMC 9/2/98	293	0	0	4.8	0			186	0
FMC 9/16/98	78.1	0	0	4	0			159	0.88
FMC 9/30/98	0	0	0	6.5	0			184	0.49
FMC 10/14/98	73.5	0	0	7.5	0			184	0.51
FMC 11/18/98	118	0	0	5.3	0			152	3
FMC 12/16/98	0	0	0	7	0			140	1.2
FMC 12/21/98	77.4	0	0	5.8	0			135	0.59
FMC 12/22/98	93.4	0	0	8.3	0			149	0.56
FMC 12/28/98	0	0	0	3.7	4.2			127	0.53
# data points	21	20	23	24	23	2	1	20	24
Maximum	300	300	100	17	4.2	2	50	236.97	5
CV	1.7	3.6	3.8	0.4	4.0	0.6	0.6	0.3	0.9

EFFLUENT DATA								
	Chromium, total (µg/L)	Cobalt (µg/L)	COD (mg/L)	Color (µg/L)	Copper (µg/L)	Cyanide (µg/L)	DO (mg/L)	Flow (mgd)
STORET								
FMC Appl. 6/5/87	3.5	9	5	1	26	20		2.67
EPA Insp. 1993	3				6			
FMC 1/6/94	10							
FMC 1/12/94	10							
FMC 1/19/94	20							
FMC 6/16/94	10							
EPA Insp. 1994					12			
EPA 1997	2.7	9			14.8			
EPA 1997	6.3							
NEIC 1993	0				0			
EPA 1993	28	8.32			11.11		6.2	
EPA 1993	2.6	7.59			5.03		6.4	
EPA 1993	2.77	8.76			10.64		6.5	
EPA 1993	3.09	8.47			14.98		6.2	
EPA 1993	2.82	9.42			15.8		6.2	
EPA 1993	2.76	6.72			10.01		6.2	
EPA 1993	3.07	8.76			10.3		6.2	
EPA 1993	2.82	8.69			12.71		6.2	
FMC Appl. 1998		6	56					3.024
FMC 8/12/98							10.2	
FMC 8/26/98	0	0			10.1	0	8.8	
FMC 9/2/98	0	0			4.1	0	7.5	1.78
FMC 9/16/98	3.8	0			7.7	0	10	1.15
FMC 9/30/98	0	0			16.4	0	10	1.79
FMC 10/14/98	0	0			10.5	0	8.6	2.58
FMC 11/18/98	0	0			12.9	15	8.3	2.92
FMC 12/16/98	0	0			11.6	0	9.9	2.37
FMC 12/21/98	0	0			10.3	0	10	2.24
FMC 12/22/98	0	0			9.1	0	9.8	2.45
FMC 12/28/98	4.6	0			9.9	0	9.4	2.37
# data points	27	21	2	1	23	11	19	11
Maximum	28	9.42	56	1	26	20	10.2	1.95
CV	1.5	1.0	0.6	0.6	0.5	2.4	0.2	0.5

EFFLUENT DATA									
	Fluoride (µg/L)	Hardness (mg/L)	Iron (µg/L)	Lead (µg/L)	Lead-210 (pCi/L)	Lithium (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)
STORET									
FMC Appl. 6/5/87	8200		0	0			10	0	
EPA Insp. 1993	600		50						
FMC 1/6/94	3000	130.25							
FMC 1/12/94	800	148.25							
FMC 1/19/94	340	140.25							
FMC 6/16/94	700	147.25	100						
EPA Insp. 1994	900								
EPA 1997			174	1.1			8.5	0	
EPA 1997				1.5				0	
NEIC 1993	700			0				0	
EPA 1993	700	168	0	0		51.43	5.14	0	18.03
EPA 1993		170	0	0		44.46	2.45	0	18.03
EPA 1993	700	170	0	0		45.22	2.45	0	13.72
EPA 1993	700	178	0	0		46.27	9.19	0	13
EPA 1993	600	194	0	0		45.7	8.45	0	13
EPA 1993	600	188	0	0		44.36	12.01	0	13
EPA 1993	700	180	0	0		44.27	7.23	0	13
EPA 1993	600	164	0	0		47.04	7.23	0	15.65
FMC Appl. 1998	1100		87	0			4		
FMC 8/12/98	0			0	0.153	51.6			0
FMC 8/26/98	0	250	0	0	0.923	50.6	4.9	0	0
FMC 9/2/98	0	260	292	0	0.421	50	23.1	0	0
FMC 9/16/98	0	230	51.6	0	0.16	50	7.5	0.084	0
FMC 9/30/98	0	230	0	0	0.336	50	6.4	0	0
FMC 10/14/98	0	290	123	0	2.53	50	11.1	0	0
FMC 11/18/98	0	280	242	0	1.57	50	7.2	0	0
FMC 12/16/98	0	230	53.2	0	1.28	50	6.7	0	0
FMC 12/21/98	0	230	0	0		50	4.6	0	0
FMC 12/22/98	0	230	0	0	0.341	50	4.9	0	0
FMC 12/28/98	0	230	67.2	0	0.403	50	6.1	0	0
# data points	27	22	23	22	10	19	21	22	18
Maximum	8200	290	292	1.5	2.53	51.6	23.1	0.084	18.03
CV	2.1	0.3	1.6	3.4	1.0	0.1	0.6	4.8	1.2

EFFLUENT DATA							
	Nickel (µg/L)	Nitrite+Nitrate (µg/L)	Oil & Grease (mg/L)	Orthophosphate (µg/L)	pH (s.u.)	Phenol (µg/L)	Polonium-210 (pCi/L)
STORET		90					
FMC Appl. 6/5/87	1	1600	5			8	
EPA Insp. 1993	5	1200		400			
FMC 1/6/94							
FMC 1/12/94					8.87		
FMC 1/19/94							
FMC 6/16/94			5				
EPA Insp. 1994							
EPA 1997	8.7				8.48		
EPA 1997							
NEIC 1993	0			580			
EPA 1993	11	1250		312	8.8		
EPA 1993	11	1370		480	8.9		
EPA 1993	11	1210		428	8.7		
EPA 1993	11	1210		633	8.7		
EPA 1993	11	1130		385	8.8		
EPA 1993	11	1240		383	8.8		
EPA 1993	11	1260		338	8.5		
EPA 1993	11	1130		300	9		
FMC Appl. 1998		1590			9.1	20	
FMC 8/12/98		1300		0	8.49		0.0778
FMC 8/26/98		0		0	8.43		0.13
FMC 9/2/98		0		0	8.24		0.0605
FMC 9/16/98		1400		698	8.33		0
FMC 9/30/98		1400		100	8.56		0.191
FMC 10/14/98		1500		0	8.34		0.22
FMC 11/18/98		1400		700	8.17		0.125
FMC 12/16/98		1500		0	8.27		0.244
FMC 12/21/98		1500		0	8.47		
FMC 12/22/98		1500		0	8.36		0.164
FMC 12/28/98		1500		0	8.22		0.182
# data points	12	22	1	21	22	2	10
Maximum	11	1600	5	700	9.1	20	0.224
CV	0.5	0.3	0.6	0.9	0.03	0.6	0.6

EFFLUENT DATA						
	Radiation, Gross Alpha (pCi/L)	Radium-226+Radium-228 (pCi/L)	Selenium (µg/L)	Silver (µg/L)	Specific Conductance (umhos/cm)	Sulfate (mg/L)
STORET						
FMC Appl. 6/5/87	3	1		0.2		37
EPA Insp. 1993	2	2	1			75.1
FMC 1/6/94						
FMC 1/12/94						
FMC 1/19/94						
FMC 6/16/94			8			
EPA Insp. 1994						
EPA 1997			3.6	3.6		
EPA 1997			3.6	2.3		
NEIC 1993			0	0		
EPA 1993	2.12	0.59	2	4	1351	75
EPA 1993	2.3	0	2	4	592	
EPA 1993	0.05	0	2	4	644	75
EPA 1993	0.74	0.49	2	4	684	78
EPA 1993	1.71	6.68	2	4	200	72
EPA 1993	3.42	0		4	200	80
EPA 1993	0	0	2	4	696	77
EPA 1993	0	0	2	4	712	69
FMC Appl. 1998	5.75	0.2				72.8
FMC 8/12/98	2.83	0.7962			540	65.8
FMC 8/26/98	3.43	1.95	0	0	760	0
FMC 9/2/98	2.85	0.728	0	0	610	33.9
FMC 9/16/98	1.53	0.5775	0	0	670	72
FMC 9/30/98	3.29	0.219	0	0	690	67.9
FMC 10/14/98	2.29	0.531	0	1.2	750	75.4
FMC 11/18/98	2.75	0.3442	0	0	850	71.7
FMC 12/16/98	2.22	0.6504	0	0	780	74.1
FMC 12/21/98			0	0	770	74
FMC 12/22/98	0.947	0.479	0	0	670	76.1
FMC 12/28/98	6.71	0.5552	0	0	770	74.3
# data points	21	21	23	22	19	21
Maximum	6.71	6.68	8	4	1351	80
CV	0.8	1.8	1.4	1.1	0.3	0.3

EFFLUENT DATA								
	Temperature (°C)	Thallium (µg/L)	TDS (mg/L)	Total Phosphorus (µg/L)	Total Residual Chlorine (µg/L)	TSS (µg/L)	TSS (lbs/day)	Turbidity (NTU)
STORET				7000				
FMC Appl. 6/5/87	36.1	20			50	1		
EPA Insp. 1993			616.5	500	81.6			
FMC 1/6/94	31.6		930			232000		
FMC 1/12/94	25		3015			0		
FMC 1/19/94	31		3250			13000		
FMC 6/16/94	28		1160	510		4000		
EPA Insp. 1994				700				
EPA 1997	31.1	2.6	585	557				
EPA 1997		2.7						
NEIC 1993		10		700				
EPA 1993	22.2	1	490	345		4000		
EPA 1993	18.5	1	400	515		4000		
EPA 1993	22.1	1	490	495		4000		
EPA 1993	23.3	1	430	855		6000		
EPA 1993	24.2	1	410	470		4000		
EPA 1993	24.2	1	440	440		4000		
EPA 1993	18.7	1	460	395		4000		
EPA 1993	19.9	1	1810	335		4000		
FMC Appl. 1998	31			460		2000	50	
FMC 8/12/98	21		400		10			
FMC 8/26/98	18	0	480	.2	80			0
FMC 9/2/98	22.4	0	360	680	40			2.9
FMC 9/16/98	27.2	0	430	2100	20			0
FMC 9/30/98	25.6	0	150	0	0			1
FMC 10/14/98	21.1	0	440	320	0			4.5
FMC 11/18/98	20	0	490	330	0			0
FMC 12/16/98	17.8	0	480	180	0			0
FMC 12/21/98	15.6	0	460	150	0			0
FMC 12/22/98	17.8	0	420	87				1.5
FMC 12/28/98	22.8	0	460	280	0			0
# data points	26	22	25	24	12	14	1	10
Maximum	36.1	20	3250	2100	81.6	232000	50	4.5
CV	0.2	2.4	1.0	0.9	1.4	3.0	0.6	1.7

EFFLUENT DATA			
	Vanadium (µg/L)	Whole Effluent Toxicity, Chronic (TUc)	Zinc (µg/L)
STORET			
FMC Appl. 6/5/87			
EPA Insp. 1993			30
FMC 1/6/94			9
FMC 1/12/94			
FMC 1/19/94			
FMC 6/16/94			
EPA Insp. 1994			17
EPA 1997	15.1		75.1
EPA 1997	7.4		73.3
NEIC 1993			0
EPA 1993	4.42		15.03
EPA 1993	4.68		12.57
EPA 1993	2.42		13.79
EPA 1993	4.12		30.87
EPA 1993	5.25		11.37
EPA 1993	2.3		19.64
EPA 1993	3.77		19.38
EPA 1993	5.15		18.35
FMC Appl. 1998			20
FMC 8/12/98		1	
FMC 8/26/98	5.1	1	31.3
FMC 9/2/98	3.3		30.4
FMC 9/16/98	3.5	1	0
FMC 9/30/98	4	1	40.2
FMC 10/14/98	4.9	1	35.7
FMC 11/18/98	4.5	1	50
FMC 12/16/98	4.1	1	78.1
FMC 12/21/98	3.9		74.7
FMC 12/22/98	4.3		32.9
FMC 12/28/98	4.8		38.9
# data points	20	7	25
Maximum	15.1	1	78.1
CV	0.6	0.6	0.8

AMBIENT DATA									
	Aluminum (µg/L)	Ammonia (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Beryllium (µg/L)	BOD (mg/L)	BOD (lb/day)	Boron (µg/L)	Cadmium (µg/L)
STORET									3
STORET						10.5			
STORET		1060				16			
STORET		26000							
STORET		70							
EPA 4/9/1993	1020	0	0	6.3	0			380	
EPA 7/1993	1880	500	0	2.9	1			90	0.3
EPA 7/1992									0
EPA 10/1992									
EPA 2/1993									
EPA 4/1993	1020								
EPA 9/1995	1020	0		6				380	
FMC 8/12/1998									
FMC 8/26/1998	439	0	0	7.2	0			121	0
FMC 9/2/1998	0	0	0	5.4	0			250	0.37
FMC 9/16/1998	1100	0	0	0	0			87.2	0.32
FMC 9/30/1998	576	0	0	4.1	0			114	0
FMC 10/14/1998	282	0	0	4.2	0			104	0
FMC 11/18/1998	246	0	0	0	0			86.3	0
FMC 12/16/1998	734	0	0	6.9	0			0	0
FMC 12/29/1998	598	0	0	0	0			0	0
FMC 12/30/1998	229	0	0	3.6	0			0	0
FMC 1/4/1999	330	0	0	4.1	0			0	0
# data points	15	17	13	14	13	2	0	14	14
95th percentile	1334	6048	0	7.0	0.4	15.7	0	380	1.3

AMBIENT DATA								
	Chromium, total (µg/L)	Cobalt (µg/L)	COD (mg/L)	Color (µg/L)	Copper (µg/L)	Cyanide (µg/L)	DO (mg/L)	Flow (mgd)
STORET								
STORET			58				15.2	
STORET			86				15.9	

AMBIENT DATA								
	Chromium, total (µg/L)	Cobalt (µg/L)	COD (mg/L)	Color (µg/L)	Copper (µg/L)	Cyanide (µg/L)	DO (mg/L)	Flow (mgd)
STORET								
STORET								
EPA 4/9/1993	2	8			15			
EPA 7/1993	1	4			7			
EPA 7/1992								
EPA 10/1992								
EPA 2/1993								
EPA 4/1993								
EPA 9/1995					15		9.3	
FMC 8/12/1998							9.6	
FMC 8/26/1998	0	0			0	0	8.7	
FMC 9/2/1998	0	0			8.2	0	8.2	
FMC 9/16/1998	3.5	0			0	0	10	
FMC 9/30/1998	0	0			0	0	10	
FMC 10/14/1998	0	0			11	0	10	
FMC 11/18/1998	0	0			3.4	0	10	
FMC 12/16/1998	0	0			0	0	11	
FMC 12/29/1998	0	0			0	0	11	
FMC 12/30/19980	3.5	0			0	0	8.8	
FMC 1/4/1999	0	0			0	0	10	
# data points	13	13	2	0	14	11	14	0
95th percentile	3.5	5.6	85	0	15	0	15.4	0

AMBIENT DATA									
	Fluoride (µg/L)	Hardness (mg/L)	Iron (µg/L)	Lead (µg/L)	Lead-210 (pCi/L)	Lithium (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)
STORET									
STORET		320							
STORET		332							
STORET									
STORET		307							
EPA 4/9/1993	650	188.3	413	2		49	23	0	0
EPA 7/1993	300	196	1465	1		27	48	0	0
EPA 7/1992						49			
EPA 10/1992						49			
EPA 2/1993						48			
EPA 4/1993			1050			23			
EPA 9/1995	700	188	410			49	23		
FMC 8/12/1998	0				0.419	50			
FMC 8/26/1998	0	240	451	0	0	50	23.1	0	0
FMC 9/2/1998	0	240	0	0	0.859	50.3	0	0	0
FMC 9/16/1998	0	260	995	0	0.612	50	46.2	0	0
FMC 9/30/1998	0	290	258	0	0.827	50	21.6	0.088	0
FMC 10/14/1998	0	370	305	0	0.467	50	17.3	0	0
FMC 11/18/1998	0	310	216	0	1.98	50	29.5	0	0
FMC 12/16/1998	0	320	759	0		50	42.9	0	0
FMC 12/29/1998	0	310	510	0	0.32	50	16.1	0	0
FMC 12/30/1998	0	350	225	0	0.0161	50	13	0.12	0
FMC 1/4/1999	0	350	389	0	0.343	50	45.4	0	0
# data points	14	17	15	13	11	18	14	13	13
95th percentile	670	354	1175	1.4	1.4195	50.0	46.8	0.101	0

AMBIENT DATA							
	Nickel (µg/L)	Nitrite+Nitrate (µg/L)	Oil & Grease (mg/L)	Orthophosphate (µg/L)	pH (s.u.)	Phenol (µg/L)	Polonium-210 (pCi/L)
STORET							

AMBIENT DATA							
	Nickel (µg/L)	Nitrite+Nitrate (µg/L)	Oil & Grease (mg/L)	Orthophosphate (µg/L)	pH (s.u.)	Phenol (µg/L)	Polonium-210 (pCi/L)
STORET		1141	152		8.9		
STORET					8.6		
STORET		400		5100			
STORET							
EPA 4/9/1993	13	1290		320	8.52		
EPA 7/1993	10	570		80			
EPA 7/1992		1200					
EPA 10/1992		1600		500			
EPA 2/1993		1900					
EPA 4/1993		1000		250			
EPA 9/1995		1290		320	8.5		
FMC 8/12/1998		0		0	8.37		0.0325
FMC 8/26/1998		0		0	8.4		0.101
FMC 9/2/1998		1400		0	8.32		0.112
FMC 9/16/1998		0		0	8.25		1.09
FMC 9/30/1998		580		0	8.2		0.123
FMC 10/14/1998		820		0	8.38		0.104
FMC 11/18/1998		980		0	8.12		0
FMC 12/16/1998		1200		0	8.1		
FMC 12/29/1998		1300		0	8.14		0.038
FMC 12/30/1998		1300		0	8.13		0
FMC 1/4/1999		1200		0	8.05		0.156
# data points	2	20	1	17	15	0	10
95th percentile	12.85	1615	152	1420	8.69	0	0.6697

AMBIENT DATA						
	Radiation, Gross Alpha (pCi/L)	Radium-226+Radium-228 (pCi/L)	Selenium (µg/L)	Silver (µg/L)	Specific Conductance (umhos/cm)	Sulfate (mg/L)
STORET						
STORET						
STORET						
STORET						
STORET						
EPA 4/9/1993	5.8	1.44	5.3	2.9	738	65.4
EPA 7/1993	1	1	0	0		35
EPA 7/1992	0	0				62.5
EPA 10/1992	0	0				70
EPA 2/1993	3.69	1.19				70
EPA 4/1993	0	1.14				58
EPA 9/1995					738	65
FMC 8/12/1998	2.3	0.6177			460	24.7
FMC 8/26/1998	3.02	0.691	0	0	570	0
FMC 9/2/1998	1.55	1.1469	0	0	680	76.8
FMC 9/16/1998	8.7	0.6968	0	0	620	34.8
FMC 9/30/1998	5.69	0.4212	0	0	660	35.3
FMC 10/14/1998	1.85	0.539	0	0	690	37.3
FMC 11/18/1998	1.42	1.3736	0	0	760	37.8
FMC 12/16/1998			0	0	680	37.2
FMC 12/29/1998	3.19	0.5539	1.9	0	750	36
FMC 12/30/1998	4.09	0.3319	0	0	720	35.8
FMC 1/4/1999	1.88	0.422	0	0	750	35.8
# data points	17	17	13	13	13	18
95th percentile	6.38	1.38688	3.26	1.16	754	71

AMBIENT DATA								
	Temperature (°C)	Thallium (µg/L)	Total Dissolved Solids (mg/L)	Total Phosphorus (µg/L)	Total Residual Chlorine (µg/L)	Total Suspended Solids (µg/L)	Total Suspended Solids (lbs/day)	Turbidity (NTU)
STORET								
STORET								
STORET								
STORET				7500				
STORET								
EPA 4/9/1993	17.6	0	403.3	640				27
EPA 7/1993		0	340	140				2
EPA 7/1992				920				70
EPA 10/1992				500				5
EPA 2/1993				750				6
EPA 4/1993				400				0
EPA 9/1995	17.6		406	640		5000		27
FMC 8/12/1998	21		0.340		130			
FMC 8/26/1998		0	0.360	0.2	10			3.7
FMC 9/2/1998	19	0	0.420	740	420			0
FMC 9/16/1998	17.7	0	0.380	0	90			33
FMC 9/30/1998		0	0.380	0	130			7
FMC 10/14/1998	15.3	0	0.420	76	40			10
FMC 11/18/1998	9	0	0.420	69	30			3.5
FMC 12/16/1998		0	0.420	0				5.1
FMC 12/29/1998	4.7	0	0.440	110	60			4
FMC 12/30/1998	5.6	0	0.420	130	50			24
FMC 1/4/1999	3.3	0	0.470	120				22
# data points	13	13	14	19	10	1	0	11
95th percentile	19.8	0	404	1578	290	5000	0	41.5

AMBIENT DATA			
	Vanadium (µg/L)	Whole Effluent Toxicity, Chronic (TUc)	Zinc (µg/L)
STORET			
STORET			
STORET			
STORET			
STORET			
RCRA 4/9/1993	27		39
RCRA 7/1993	2		20
RCRA 7/1992	70		
RCRA 10/1992	5		
RCRA 2/1993	6		
RCRA 4/1993	0		
RCRA 9/1995	27		
FMC 8/12/1998			
FMC 8/26/1998	3.7		0
FMC 9/2/1998	3.9		79.7
FMC 9/16/1998	2.9		0
FMC 9/30/1998	2.3		26.9
FMC 10/14/1998	1.9		25.1
FMC 11/18/1998	2.1		37.6
FMC 12/16/1998	2.9		64.1
FMC 12/29/1998	3		21.6
FMC 12/30/1998	3.2		0
FMC 1/4/1999	3.7		54.8
# data points	18	0	13
95th percentile	33.5	0	70.3

EFFLUENT DATA TEMPERATURE August 2 - March 31 (1994-1999)		
	Daily Avg. °C	Daily Max. °C
Mar 1999	26	29
Feb 1999	26	29
Jan 1999	22	27
Nov 1998	23	24
Oct 1998	23	25
Sep 1998	25	28
Aug 1998	24	27
Feb 1998	24	26
Jan 1998	24	26
Dec 1997	23	25
Nov 1997	25	27
Oct 1997	26	28
Sep 1997	27	31
Aug 1997	29	31
Mar 1997	27	29
Feb 1997	26	28
Jan 1997	26	29
Dec 1996	23	27
Nov 1996	21	22
Oct 1996	22	24
Sep 1996	22	24
Aug 1996	23	26
Mar 1996	23	27
Feb 1996	23	26
Jan 1996	22	24
Dec 1995	22	24
Nov 1995	23	26
Oct 1995	22	25
Sep 1995	27	29
Aug 1995	26	28
Mar 1995	23	26
Feb 1995	23	28
Jan 1995	21	24
Dec 1994	23	28
Nov 1994	21	24
Oct 1994	22	22
Sep 1994	24	26
Aug 1994	26	28

EFFLUENT DATA TEMPERATURE August 2 - March 31 (1994-1999)		
	Daily Avg. °C	Daily Max. °C
Mar 1994	26	30
Feb 1994	26	28
Jan 1994	29	31
# data	41	41
Max	29	31
CV	0.08	0.08

EFFLUENT DATA TEMPERATURE April 1 - August 1 (1994-1999)		
	Daily Avg. °C	Daily Max. °C
Apr 1999	24	26
Jul 1998	28	29
Jun 1998	27	28
Jul 1997	29	31
Jun 1997	28	29
May 1997	28	31
Apr 1997	26	29
Apr 1996	25	31
Jul 1995	27	28
Jun 1995	24	32
May 1995	24	26
Apr 1995	22	24
Jul 1994	24	27
Jun 1994	24	28
May 1994	26	27
Apr 1994	22	24
Aug 1994	29	32
# data	16	16
Max	29	32
CV	0.08	0.08

AMBIENT DATA TEMPERATURE August 2 - March 31 (1965-1992)	
DATE	°C
10/03/65	10.5
12/13/65	3.5
01/19/66	0.5
02/24/66	1
03/28/66	9
09/29/66	15.5
12/09/66	1
01/13/67	0.5
02/14/67	5
03/16/67	5
08/31/67	19.5
10/04/67	12
02/01/68	1
08/22/68	15
12/05/68	3
12/19/69	4.5
08/19/70	22
10/06/70	9
10/15/71	9
11/03/72	6
03/30/73	6
08/03/73	20
08/31/73	16
09/24/73	12
09/25/73	10
11/01/73	6
12/06/73	2
01/23/74	2
02/15/74	2.5
03/18/74	7
09/12/74	18
09/25/74	15
11/05/74	7
12/17/74	2
02/07/75	1
03/21/75	6
08/08/75	20
09/23/75	11

AMBIENT DATA TEMPERATURE August 2 - March 31 (1965-1992)	
DATE	°C
10/28/75	5
01/20/76	2
09/16/76	14
10/22/76	6
12/03/76	1
01/25/77	0
03/11/77	4
08/16/77	22
09/23/77	11.5
11/08/77	4
09/28/78	15
03/07/79	8
08/22/79	19
10/25/79	10
12/13/79	0.5
02/05/80	3
03/24/80	7
09/22/80	15
11/03/80	8.5
11/12/80	7.5
01/06/81	3.5
02/23/81	3
08/21/81	19
0/24/81	14.5
11/05/81	7.5
12/30/81	0.7
03/01/82	7.5
03/25/82	8
09/10/82	16
10/28/82	8
12/08/82	0.5
01/13/83	4.5
03/04/83	6
08/16/83	19
09/22/83	12
11/10/83	5.5
01/06/84	3.5
02/24/84	1

AMBIENT DATA TEMPERATURE August 2 - March 31 (1965-1992)	
DATE	°C
08/29/84	21
10/09/84	12
11/14/84	5
01/02/85	1.5
03/18/85	7
08/27/85	19.5
10/14/85	8
11/25/85	2
01/21/86	4
03/03/86	8
08/11/86	19
09/22/86	11
12/08/86	6
03/09/87	6
08/17/87	16
09/24/87	17
11/06/87	10
12/22/87	2
03/07/88	5.5
10/20/88	12.5
11/22/88	5
# data	109
95th %	20

AMBIENT DATA TEMPERATURE April 1 - August 1 (1966-1999)	
DATE	°C
05/02/66	12
06/10/66	17
04/21/67	7
04/03/69	10
06/12/70	13.5
04/08/71	10
07/09/71	18
04/12/72	6.5
06/19/72	15.5
04/23/73	9

AMBIENT DATA TEMPERATURE April 1 - August 1 (1966-1999)	
DATE	°C
05/21/73	12.5
06/26/73	19
06/07/74	11
07/09/74	18.5
05/16/75	9.5
06/25/75	8
04/02/76	3.5
06/04/76	14
07/23/76	18.5
04/19/77	7.5
05/26/77	13
07/07/77	24.5
07/14/78	19
04/20/79	9
05/24/79	17
07/10/79	21
05/12/80	9
07/14/80	19.5
04/16/81	13
05/20/81	14
07/09/81	24
05/06/82	8.5
05/13/82	10.5
06/16/82	17.5
07/28/82	21.5
04/21/83	8.5
05/09/83	8.5
05/26/83	14
05/31/83	13.5
04/10/84	9.5
05/04/84	8
05/10/84	11
05/15/84	11
05/29/84	13.5
06/26/84	19
07/19/84	24
05/01/85	13.5
06/03/85	15

AMBIENT DATA TEMPERATURE April 1 - August 1 (1966-1999)	
DATE	°C
07/08/85	25
04/14/86	8
05/19/86	14
06/30/86	20
04/13/87	9
04/15/88	14
05/31/88	12.5
05/02/89	13
06/13/89	19.5
07/25/89	25.5
04/04/90	14.5
05/23/90	18.5
06/26/90	25.5
04/16/92	15
05/28/92	21
04/09/93	17.6
# data	64
95th %	24

SECTION 2 - CALCULATIONS FROM MODEL SPREADSHEET

Pollutant		Aluminum		Ammonia		Antimony		Arsenic		Beryllium	
Most Stringent Criteria		agriculture		chronic, aquatic life		recreation, human health		recreation, human health		agriculture	
Criteria Value		5.00E+000	mg/L	2.40E-001	mg/L	4.30E+000	mg/L	5.00E-002	mg/L	1.00E-001	mg/L
Maximum Effluent Concentration		3.00E-001	mg/L	3.00E-001	mg/L	1.00E-001	mg/L	1.7E-002	mg/L	4.2E-003	mg/L
Upstream Concentration (Dissolved)	(For metals only)		mg/L		mg/L		mg/L	3.00E-003	mg/L		mg/L
Upstream Concentration (Total Recoverable)		1.33E+000	mg/L	6.05E+000	mg/L	0	mg/L	7.00E-003	mg/L	4.00E-004	mg/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	130	mg/L	130	mg/L	130	mg/L	130	mg/L	130	mg/L
	chronic	130	mg/L	130	mg/L	130	mg/L	130	mg/L	130	mg/L
Translator	acute	1		1		1		1		1	
	chronic	1		1		1		1		1	
CV		1.7		3.6		3.8		0.4		4	
Mixing Zone		0	%	0	%	0	%	0	%	0	%
WER		1		1		1		1		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	5.57		11.50		10.41		1.71		10.84	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	1.67E+000	mg/L	3.45E+000	mg/L	1.04E+000	mg/L	2.90E-002	mg/L	4.55E-002	mg/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	1.67E+000	mg/L	3.45E+000	mg/L	1.04E+000	mg/L	2.90E-002	mg/L	4.55E-002	mg/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	NC	mg/L	2.40E-001	mg/L	NC	mg/L	NC	mg/L	NC	mg/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s)		mg/L	3.00E-002	mg/L		mg/L		mg/L		mg/L
	LTAc=WLA*exp(0.5*s4^2-z*s4)										
Required Sample Frequency per Month		4		4		4		4		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2)	No RP	mg/L	3.53E-001	mg/L	No RP	mg/L	No RP	mg/L	No RP	mg/L
	MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)										
Maximum Daily Loading	Lmd=MDL*Qe*8.34		lb/day	6.7IE+000	lb/day		lb/day		lb/day		lb/day
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2)	No RP	mg/L	7.55E-002	mg/L	No RP	mg/L	No RP	mg/L	No RP	mg/L
	AML=WLA										
Average Monthly Loading	Lam=AML*Qe*8.34		lb/day	1.44E+000	lb/day		lb/day		lb/day		lb/day

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

Pollutant		Boron		Cadmium		Chromium, total		Cobalt		Copper	
Most Stringent Criteria		agriculture		chronic, aquatic life		chronic, aquatic life		agriculture		chronic, aquatic life	
Criteria Value		7.50E-001	mg/L	2.44E-003	mg/L	4.37E-001	mg/L	5.00E-002	mg/L	3.07E-002	mg/L
Maximum Effluent Concentration		2.37E-001	mg/L	5.00E-003	mg/L	2.80E-002	mg/L	9.42E-003	mg/L	2.60E-002	mg/L
Upstream Concentration (Dissolved)	(For metals only)		mg/L		mg/L		mg/L		mg/L	1.10E-002	mg/L
Upstream Concentration (Total Recoverable)		3.80E-001	mg/L	0.00E+000	mg/L	3.50E-003	mg/L	5.60E-003	mg/L	1.50E-002	mg/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	130	mg/L	137	mg/L	130	mg/L	130	mg/L	137	mg/L
	chronic	130	mg/L	140	mg/L	130	mg/L	130	mg/L	140	mg/L
Translator	acute	1		1.07		1		1		1.04	
	chronic	1		1.12		1		1		1.04	
CV		0.3		1.16		1.5		1.0		0.5	
Mixing Zone		0	%	25	%	0	%	0	%	25	%
WER		1		1		1		1		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	1.56		2.92		4.18		3.41		1.95	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	3.69E-001	mg/L	1.30E-002	mg/L	1.17E-001	mg/L	3.21E-002	mg/L	4.88E-002	mg/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	3.69E-001	mg/L	8.18E-003	mg/L	1.17E-001	mg/L	3.21E-002	mg/L	3.51E-002	mg/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	NC	mg/L	4.00E-003	mg/L	NC	mg/L	NC	mg/L	2.98E-002	mg/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s) LTAc=WLA*exp(0.5*s4^2-z*s4)		mg/L	2.00E-003	mg/L		mg/L		mg/L	1.11E-002	mg/L
Required Sample Frequency per Month		4		4		4		4		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2) MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)	No RP	mg/L	2.98E-003	mg/L	No RP	mg/L	No RP	mg/L	2.98E-002	mg/L
Maximum Daily Loading	Lmd=MDL*Qe*8.34		lb/day	5.67E-002	lb/day		lb/day		lb/day	5.66E-001	lb/day
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2) AML=WLA	No RP	mg/L	1.15E-003	mg/L	No RP	mg/L	No RP	mg/L	1.58E-002	mg/L
Average Monthly Loading	Lam=AML*Qe*8.34		lb/day	2.19E-002	lb/day		lb/day		lb/day	3.01E-001	lb/day

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

Pollutant		Cyanide (WAD)		Fluoride		Gross Alpha Radiation		Iron		Lead	
Most Stringent Criteria		chronic, aquatic life		agriculture		agriculture		agriculture		chronic, aquatic life	
Criteria Value		5.20E-003	mg/L	1.00E+000	mg/L	1.50E+001	pCi/L	5.00E+000	mg/L	7.85E-003	mg/L
Maximum Effluent Concentration		2.00E-002	mg/L	8.20E+000	mg/L	6.71E+000	pCi/L	2.92E-001	mg/L	1.50E-003	mg/L
Upstream Concentration (Dissolved)	(For metals only)		mg/L		mg/L		pCi/L		mg/L	0.00E+000	mg/L
Upstream Concentration (Total Recoverable)		0.00E+000	mg/L	6.68E-001	mg/L	6.38E+000	pCi/L	1.17E+000	mg/L	1.40E-003	mg/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	137	mg/L	130	mg/L			130	mg/L	137	mg/L
	chronic	140	mg/L	130	mg/L			130	mg/L	140	mg/L
Translator	acute	1		1		1		1		1.33	
	chronic	1		1		1		1		1.33	
CV		2.4		2.1		0.8		1.6		3.4	
Mixing Zone		25	%	100	%	100	%	0	%	25	%
WER		1		1		1		1		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	14.2		5.55		2.82		4.93		9.94	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	2.84E-001	mg/L	4.55E+001	mg/L	1.89E+001	pCi/L	1.44E+000	mg/L	1.12E-002	mg/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	1.47E-001	mg/L	4.79E+000	mg/L	7.53E-003	pCi/L	1.44E+000	mg/L	6.02E-003	mg/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	1.01E-002	mg/L	4.28E+001	mg/L	NC	pCi/L	NC	mg/L	7.71E-003	mg/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s) LTAc=WLA*exp(0.5*s4^2-z*s4)	1.74E-003	mg/L		mg/L		pCi/L		mg/L	1.01E-003	mg/L
Required Sample Frequency per Month		4		4		4		4		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2) MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)	1.67E-002	mg/L	1.70E+001	mg/L	No RP	pCi/L	No RP	mg/L	1.15E-002	mg/L
Maximum Daily Loading	Lmd=MDL*Qe*8.34	3.18E-001	lb/day	3.23E+002	lb/day				lb/day	2.20E-001	lb/day
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2) AML=WLA	4.01E-003	mg/L	4.26E+000	mg/L	No RP	pCi/L	No RP	mg/L	2.50E-003	mg/L
Average Monthly Loading	Lam=AML*Qe*8.34	7.63E-002	lb/day	8.14E+001	lb/day				lb/day	4.76E-002	lb/day

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

Pollutant		Lithium		Manganese		Mercury		Molybdenum		Nickel	
Most Stringent Criteria		agriculture		agriculture		chronic, aquatic life		agriculture		agriculture	
Criteria Value		2.50E+000	mg/L	2.00E-001	mg/L	1.20E-005	mg/L	1.00E-002	mg/L	2.00E-001	mg/L
Maximum Effluent Concentration		5.16E-002	mg/L	2.31E-002	mg/L	8.40E-005	mg/L	1.80E-002	mg/L	1.10E-002	mg/L
Upstream Concentration (Dissolved)	(For metals only)		mg/L		mg/L	0.00E+000	mg/L		mg/L	0.00E+000	mg/L
Upstream Concentration (Total Recoverable)		5.00E-002	mg/L	4.68E-002	mg/L	1.01E-004	mg/L	0.00E+000	mg/L	1.25E-002	mg/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	130	mg/L	130	mg/L	130	mg/L	130	mg/L	130	mg/L
	chronic	130	mg/L	130	mg/L	130	mg/L	130	mg/L	130	mg/L
Translator	acute	1		1		1.18		1		1	
	chronic	1		1		1		1		1	
CV		0.1		0.6		4.8		1.2		0.5	
Mixing Zone		0	%	0	%	0	%	100	%	0	%
WER		1		1		1		1		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	1.17		2.26		13.13		4.42		2.40	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	6.02E-002	mg/L	5.23E-002	mg/L	9.35E-004	mg/L	7.97E-002	mg/L	2.64E-002	mg/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	6.02E-002	mg/L	5.23E-002	mg/L	7.92E-004	mg/L	2.24E-003	mg/L	2.64E-002	mg/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	NC	mg/L	NC	mg/L	1.20E-005	mg/L	NC	mg/L	NC	mg/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s) LTAc=WLA*exp(0.5*s4^2-z*s4)		mg/L		mg/L	1.25E-006	mg/L		mg/L		mg/L
Required Sample Frequency per Month		4		4		4		4		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2) MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)	No RP	mg/L	No RP	mg/L	1.62E-005	mg/L	No RP	mg/L	No RP	mg/L
Maximum Daily Loading	Lmd=MDL*Qe*8.34		lb/day		lb/day	3.07E-004	lb/day		lb/day		lb/day
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2) AML=WLA	No RP	mg/L	No RP	mg/L	3.29E-006	mg/L	No RP	mg/L	No RP	mg/L
Average Monthly Loading	Lam=AML*Qe*8.34		lb/day		lb/day	6.25E-005	lb/day		lb/day		lb/day

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

Pollutant		Nirate+Nitrite		Orthophosphate		Phenol		Phosphorus, total		Radium226 +Radium228	
Most Stringent Criteria		agriculture		chronic, aquatic life		recreation, human health		chronic, aquatic life		agriculture	
Criteria Value		1.00E-001	mg/L	5.00E-002	mg/L	4.60E+003	mg/L	1.00E-001	mg/L	5.00E+000	pCi/L
Maximum Effluent Concentration		1.60E+000	mg/L	7.00E-001	mg/L	2.00E-002	mg/L	2.10E+000	mg/L	6.68E+000	pCi/L
Upstream Concentration (Dissolved)	(For metals only)		mg/L		mg/L		mg/L		mg/L		pCi/L
Upstream Concentration (Total Recoverable)		1.62E+000	mg/L	1.42E+000	mg/L	0.00E+000	mg/L	1.58E+000	mg/L	1.39E+000	pCi/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	130	mg/L	130	mg/L	130	mg/L	130	mg/L		
	chronic	130	mg/L	130	mg/L	130	mg/L	130	mg/L		
Translator	acute	1		1		1		1		1	
	chronic	1		1		1		1		1	
CV		0.3		0.9		0.6		0.9		1.8	
Mixing Zone		0	%	0	%	0	%	0	%	100	%
WER		1		1		1		1		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	1.53		3.11		7.39		2.92		5.88	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	2.44E+000	mg/L	2.18E+000	mg/L	1.48E-001	mg/L	6.13E+000	mg/L	3.91E+001	pCi/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	2.44E+000	mg/L	2.18E+000	mg/L	1.48E-001	mg/L	6.13E+000	mg/L	4.86E-003	pCi/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	1.00E-001	mg/L	5.00E-002	mg/L	NC	mg/L	1.00E-001	mg/L	NC	pCi/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s)		mg/L	2.00E-002	mg/L		mg/L	4.04E-002	mg/L		pCi/L
	LTAc=WLA*exp(0.5*s4^2-z*s4)										
Required Sample Frequency per Month		4		4		4		4		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2)	1.51E-001	mg/L	9.01E-002	mg/L	No RP	mg/L	1.80E-001	mg/L	No RP	pCi/L
	MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)										
Maximum Daily Loading	Lmd=MDL*Qe*8.34	2.87E+000	lb/day	1.71E+000	lb/day		lb/day	3.43E+000	lb/day		
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2)	1.00E-001	mg/L	3.47E-002	mg/L	No RP	mg/L	6.95E-002	mg/L	No RP	pCi/L
	AML=WLA										
Average Monthly Loading	Lam=AML*Qe*8.34	1.90E+000	lb/day	6.61E-001	lb/day		lb/day	1.32E+000	lb/day		

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

Pollutant		Selenium		Silver		Thallium		Total Residual Chlorine		Vanadium	
Most Stringent Criteria		chronic, aquatic life		acute, aquatic life		recreation, human health		acute, aquatic life		agriculture	
Criteria Value		5.00E-003	mg/L	2.15E-002	mg/L	6.30E-003	mg/L	1.90E-002	mg/L	1.00E-001	mg/L
Maximum Effluent Concentration		8.00E-003	mg/L	4.00E-003	mg/L	2.00E-002	mg/L	8.16E-002	mg/L	1.51E-002	mg/L
Upstream Concentration (Dissolved)	(For metals only)		mg/L	0.00E+000	mg/L		mg/L		mg/L		mg/L
Upstream Concentration (Total Recoverable)		3.26E-003	mg/L	1.16E-003	mg/L	0.00E+000	mg/L	2.90E-001	mg/L	3.35E-002	mg/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	137	mg/L	137	mg/L	130	mg/L	130	mg/L	290	mg/L
	chronic	140	mg/L	130	mg/L	130	mg/L	130	mg/L	290	mg/L
Translator	acute	1		1.18		1		1		1	
	chronic	1		1		1		1		1	
CV		1.4		1.4		2.4		1.4		0.6	
Mixing Zone		25	%	25	%	100	%	0	%	0	%
WER		1		1		1		1		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	4.37		4.37		7.36		6.90		2.30	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	3.50E-002	mg/L	1.75E-002	mg/L	1.47E-001	mg/L	5.63E-001	mg/L	3.48E-002	mg/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	1.97E-002	mg/L	1.75E-002	mg/L	4.14E-003	mg/L	5.63E-001	mg/L	3.48E-002	mg/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	6.62E-003	mg/L	9.71E-003	mg/L	NC	mg/L	1.90E-002	mg/L	NC	mg/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s) LTAc=WLA*exp(0.5*s4^2-z*s4)	1.86E-003	mg/L	1.48E-003	mg/L		mg/L	2.90E-003	mg/L		mg/L
Required Sample Frequency per Month		4		4		4		4		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2) MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)	1.22E-002	mg/L	9.71E-003	mg/L	No RP	mg/L	1.90E-002	mg/L	No RP	mg/L
Maximum Daily Loading	Lmd=MDL*Qe*8.34	2.32E-001	lb/day	1.85E-001	lb/day		lb/day	3.61E-001	lb/day		lb/day
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2) AML=WLA	3.69E-003	mg/L	2.94E-003	mg/L	No RP	mg/L	5.75E-003	mg/L	No RP	mg/L
Average Monthly Loading	Lam=AML*Qe*8.34	7.02E-002	lb/day	5.59E-002	lb/day		lb/day	1.09E-001	lb/day		lb/day

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

Pollutant		Zinc	
Most Stringent Criteria		chronic, aquatic life	
Criteria Value		1.49E-001	mg/L
Maximum Effluent Concentration		7.81E-002	mg/L
Upstream Concentration (Dissolved)	(For metals only)	0.00E+000	mg/L
Upstream Concentration (Total Recoverable)		7.03E-002	mg/L
Hardness for Aquatic Life Criteria (CaCO3)	acute	137	mg/L
	chronic	140	mg/L
Translator	acute	1.02	
	chronic	1.01	
CV		0.8	
Mixing Zone		25	%
WER		1	
Reasonable Potential Multiplier (RPM)	RPM=C99/Cpn=exp(2.326*s-0.5*s^2)/exp(z*s-0.5*s^2)	2.61	
Max Projected Effluent Concentration	Cd=max conc. * RPM / translator	2.00E-001	mg/L
Max Projected Receiving Water Concentration	Cr=((Qd*Cd+Qs*Cs)/(Qd+Qs))*1000	1.54E-001	mg/L
Waste Load Allocation	WLA=Cd = (Cr(Qd + Qs) - Cs*Qs)/Qd	1.92E-001	mg/L
Long Term Average (aquatic life only)	LTAa=WLA*exp(0.5*s^2-z*s)	4.78E-002	mg/L
	LTAc=WLA*exp(0.5*s4^2-z*s4)		
Required Sample Frequency per Month		4	
Maximum Daily Limit	MDL=LTA*exp(z*s-0.5*s^2)	1.92E-001	mg/L
	MDL=AML*exp(zm*s-0.5*s^2)/exp(za*sn-0.5*sn^2)		
Maximum Daily Loading	Lmd=MDL*Qe*8.34	3.65E+000	lb/day
Average Monthly Limit	AML=LTA*exp(z*sn-0.5*sn^2)	7.91E-002	mg/L
	AML=WLA		
Average Monthly Loading	Lam=AML*Qe*8.34	1.51E+000	lb/day

Notes:

C99	effluent concentration at 99th percentile
Cpn	effluent concentration at nth percentile
s^2	ln(CV^2+1)
z	z-score
Cd	effluent concentration
Cr	downstream concentration=water quality criteria
Qd	effluent flow rate
Qs	upstream flow rate
Cs	upstream concentration
s4^2	ln(CV^2/4+1)
sn^2	ln(CV^2/n+1)
n	number samples required per month

SECTION 3 - HAND CALCULATIONS

I. Lead-210

A. Reasonable Potential

criterion: 10 pCi/L
maximum effluent concentration (MEC) = 1.57 pCi/L
number of data points (n) = 10
percentile based on 99% confidence level (p_n) = $(1-.99)^{1/n}$ = 0.6310
z-score for percentile (z) = 0.33
coefficient of variation (CV) = (standard deviation ÷ mean) = 0.9
$\sigma^2 = \ln(CV^2+1) = 0.59$
$\sigma = 0.77$

reasonable potential multiplier (RPM) = $\frac{c_{99}}{c_{63}} = \frac{\exp(2.326s - 0.5s^2)}{\exp(zs - 0.5s^2)}$ =4.6

maximum projected effluent concentration (Ce) = (MEC)(RPM) = 7.2

Since projected effluent concentration of 7.2 pCi/L is less than the criterion of 10 pCi/L, lead-210 does not have the potential to violate the water quality standards.

B. Limits

N/A

II. Polonium-210

A. Reasonable Potential

criterion: 40 pCi/L
maximum effluent concentration (MEC) = 0.224 pCi/L
number of data points (n) = 10
percentile based on 99% confidence level (p_n) = $(1-.99)^{1/n}$ = 0.6310
z-score for percentile (z) = 0.33
coefficient of variation (CV) = (standard deviation ÷ mean) = 0.7
$\sigma^2 = \ln(CV^2+1) = 0.40$
$\sigma = 0.63$

reasonable potential multiplier (RPM) = $\frac{c_{99}}{c_{63}} = \frac{\exp(2.326s - 0.5s^2)}{\exp(zs - 0.5s^2)}$ =3.5

maximum projected effluent concentration (Ce) = (MEC)(RPM) = 0.784 pCi/L

Since the projected effluent concentration of 0.784 pCi/L is less than the criterion of 40 pCi/L, polonium-210 does not have the potential to violate the water quality standards.

B. Limits

N/A

III. Radium-226

A. Reasonable Potential

criterion: 60 pCi/L
maximum effluent concentration (MEC) = 1.95 pCi/L
number of data points (n) = 10
percentile based on 99% confidence level (p_n) = $(1-.99)^{1/n}$ = 0.6310
z-score for percentile (z) = 0.33
coefficient of variation (CV) = (standard deviation ÷ mean) = 0.9
$\sigma^2 = \ln(CV^2+1) = 0.59$
$\sigma = 0.77$

reasonable potential multiplier (RPM) = $\frac{C_{99}}{C_{63}} = \frac{\exp(2.326\sigma - 0.5\sigma^2)}{\exp(z\sigma - 0.5\sigma^2)}$ =4.6

maximum projected effluent concentration (Ce) = (MEC)(RPM) = 8.97 pCi/L

Since the projected effluent concentration of 8.97 pCi/L is less than the criterion of 60 pCi/L, radium-226 does not have the potential to violate the water quality standards.

B. Limits

N/A

IV. Radium-228

A. Reasonable Potential

criterion: 60 pCi/L
maximum effluent concentration (MEC) = 0.121 pCi/L
number of data points (n) = 10
percentile based on 99% confidence level (p_n) = $(1-.99)^{1/n}$ = 0.6310
z-score for percentile (z) = 0.33
coefficient of variation (CV) = (standard deviation ÷ mean) = 0.6
$\sigma^2 = \ln(CV^2+1) = 0.31$
$\sigma = 0.55$

reasonable potential multiplier (RPM) = $\frac{C_{99}}{C_{63}} = \frac{\exp(2.326\sigma - 0.5\sigma^2)}{\exp(z\sigma - 0.5\sigma^2)}$ =0.95

maximum projected effluent concentration (Ce) = (MEC)(RPM) = 0.11 pCi/L

Since the projected effluent concentration of 0.11 pCi/L is less than the criterion of 60 pCi/L, radium-228 does not have the potential to violate the water quality standards.

B. Limits

N/A

V. Turbidity

A. Reasonable Potential

criterion: <5 NTU increase over background (Cu)
background (Cu) = 41.5 NTU
Qu = (1Q10)(MZ) = 1.12 mgd
    river flow (1Q10) = 4.46 mgd
    mixing zone (MZ) = 25%
maximum effluent concentration (MEC) = 4.5 NTU
average annual effluent flow (Qe) = 2.28
number of data points (n) = 10
percentile based on 99% confidence level (p_n) = $(1-.99)^{1/n}$ = 0.6310
z-score for percentile (z) = 0.33
coefficient of variation (CV) = (standard deviation ÷ mean) = 1.2
$\sigma^2 = \ln(CV^2+1) = 0.89$
$\sigma = 0.94$

reasonable potential multiplier (RPM) = $\dfrac{c_{99}}{c_{63}} = \dfrac{\exp\left(2.326s - 0.5s^{2}\right)}{\exp\left(zs - 0.5s^{2}\right)}$ =5.0

maximum projected effluent concentration (Ce) = (MEC)(RPM) = 22.5 NTU

receiving water concentration (Cr) = $\dfrac{\left(Q_eC_e + Q_uC_u\right)}{\left(Q_e + Q_u\right)}$ = 16.7 NTU

Since the projected receiving water concentration of 16.7 NTU is less than the background concentration of 41.5 NTU, turbidity does not have the potential to violate the water quality standards.

B. Limits

N/A

VI. Temperature

A. August 2 - March 31

1. Reasonable Potential

criterion (max. aquatic life): 22°C (71.6°F)
criterion (avg. aquatic life): 19°C (66.2°F)
criterion (point source treatment): net increase <1.0°C(1.8°F) outside MZ
average annual effluent flow (Qe) = 2.28 mgd
Maximum daily effluent temperature (Te) = 31°C (87.8°F)
Maximum average daily effluent temperature (Te) = 29°C (84.2°F)
C_p=1.0 BTU/lb/°F
ρ_e=8.345 lb/gallon
background (Tu) = 20°C (68°F)
Qu = (1Q10)(MZ) = 1.12 mgd
    river flow (1Q10) = 4.46 mgd
    mixing zone (MZ) = 25%

Using first law of thermodynamics: $H=mC_p\Delta T$
Assuming conservation of energy - heat lost in effluent equals heat gained in river ($H_e=H_d$): $m_eC_p(T_e-T_u)=m_dC_p(T_d-T_u)$
Divide both side by density and time to get flow:
$Q_e(T_e-T_u)=Q_d(T_d-T_u)$ where $Q_d=Q_e+Q_u$

$\mathbf{T_d=(Q_eT_e+Q_uT_u)\div(Q_e+Q_u)}$

T_d = 27°C (80.6°F) Maximum Daily
T_d = 26°C (78.8°F) Average Daily

Since the projected downstream temperature exceeds the criterion, limits are needed.

2. Limits

$\mathbf{T_e=[T_d(Q_e+Q_u)-Q_uT_u]/Q_e}$

a. Determine effluent temperature using criterion for aquatic life (T_d=criterion).

T_e = 23°C (73.4°F) Maximum Daily
T_e = 19°C (66.2°F) Average Daily

b. Determine effluent temperature using criterion for point source treatment (T_d=T_u+1°C)

T_e = 21°C (69.8°F) Maximum Daily

3. Loading (Maximum Daily)

Thermal loading can be accomplished by either limiting the flow or the temperature. Since the temperature is being limited, the thermal loading was computed as follows:

$\mathbf{H_e=m_eC_p(T_e\text{-}T_u)} = Q_e(1x10^6)\rho_eC_p(T_e\text{-}T_u) = 1.0x10^8$ BTU/day

B. April 1 - August 1

1. Reasonable Potential

criterion (max. salmonid spawn.): 13°C
criterion (avg. salmonid spawn.): 9°C
criterion (point source treatment): net increase <1.0°C(1.8°F)
background (Cu) = 24°C

Since the 95th percentile of the receiving water data for this time period exceeds the criterion, no mixing zone is allowed and the criterion will be applied as the effluent limit.

2. Limits

T_e = 13°C (55.4°F) Maximum Daily
T_e = 9°C (48.2°F) Average Daily

3. Loading (Maximum Daily)

Since the 95th percentile of the receiving water data for this time period exceeds the criterion, no thermal loading is allowed for this discharge.